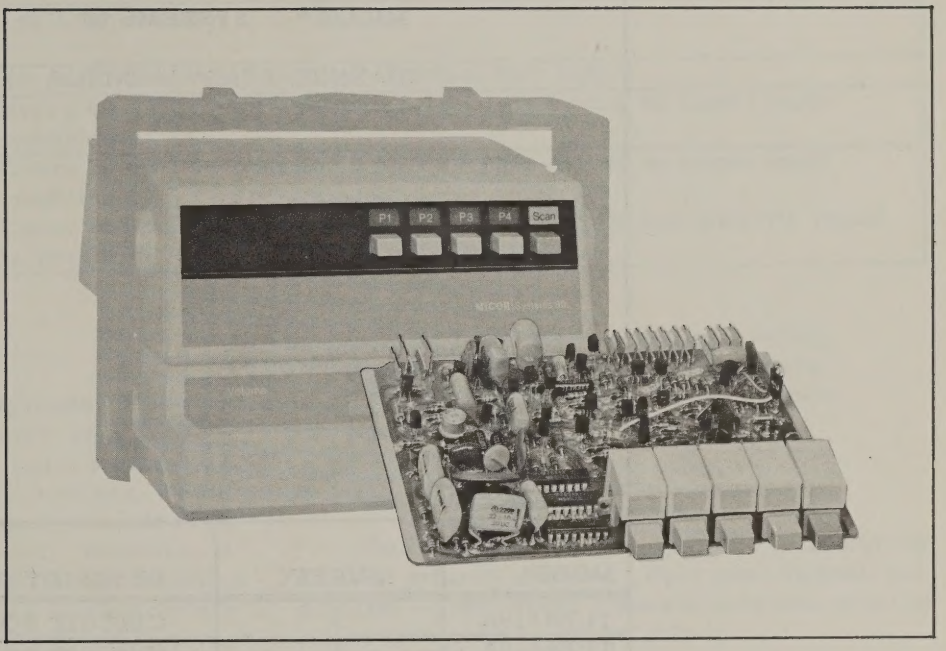
MOTOROLA

MICOR®
SYSTEMS 90
CHANNEL SCAN Monitor

Models TLN1387A, TLN1388A



Instruction Manual

68P81102E23-H

MODEL CHART

MICOR® / SYSTEMS 90

"CHANNEL-SCAN" MONITOR

SUB-MODEL	SUFFIX	DESCRIPTION	MODEL	SUFFIX	DESCRIPTION	PRIORITY SELECT	NON-PRIORITY SELECT
						TLN1387A	TLN1388A
TLN4519A	3	CIRCUIT BOARD				X	
TLN4520A	3	CIRCUIT BOARD					X
TKN6501A		CABLE KIT (YEL)				X	X
TKN6502A		CABLE KIT (YEL)				X	X
TLN4508A		HARDWARE KIT				X	
TLN4509A		HARDWARE KIT					X

EPS-8861-C

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6/30/78-NPC

TECHNICAL CHARACTERISTICS

MODEL		TLN1387A	TLN1388A
OPERATION		Sequential sampling with selectable priority	Sequential sampling with selectable non-priority
INPUT VOLTAGE		13.8 V dc ±20%; Negative ground only.	
CURRENT DRAIN AT 13.8 V DC	SCAN "OFF"	160 mA	
	SCAN "ON" NO SIGNAL RECEIVED	300 mA	
	SCAN "ON" SIGNAL RECEIVED	325 mA	
OPERATING TEMPERATURE RANGE		-30°C to +60°C	
APPLICATION		All multi-frequency "Micor" FM two-way radios	
NON-PRIORITY CHANNEL SCANNED		Every 48 milliseconds for 6 milliseconds during no signal input conditions.	
PRIORITY CHANNEL SAMPLED		Every 12 milliseconds for 6 milliseconds during no signal input conditions. Every 250 milliseconds for 6 milliseconds while non-priority signal is received.	

1. DESCRIPTION

The priority and non-priority model "Channel-Scan" monitors allow the operator of a multi-frequency "Micor" FM mobile radio to monitor up to four channels with its single receiver. When a signal is received on any channel, the unit stops scanning and the message is heard. However, if it stops on a non-priority channel, the unit continues to sample the priority channel at a rate which does not disturb the intelligibility. When a signal is received on the priority channel, the receiver switches to the priority channel and all scanning stops until priority is inactive. This assures that the operator can monitor any of the channels which the radio is capable of receiving without missing any messages on the priority channel.

The two models are physically similar. Jumper connections and the channel select switch assemblies are different to provide priority or non-priority selection capability.

a. Non-Priority Model

This model allows the operator to monitor one, two, or three channels on a non-priority, first come, first served basis.

NOTE

All four switches may be depressed at the same time. But, as shipped from the factory, priority status is automatically given to the channel selected by the control head channel selector switch. Priority may be fixed to a particular channel with a simple pin-tip jumper change.

b. Priority Model

This model allows the operator to select the desired priority channel. Only one channel has priority -- remaining channels have non-priority status (switches are interlocked).

2. INSTALLATION

a. Field Installed

The "Channel-Scan" monitor circuit card is installed in the "Systems 90" accessory housing, either alone or in combination with other "Systems 90" options. The installation instructions provided here are for the "Channel-Scan" monitor used as the only option.

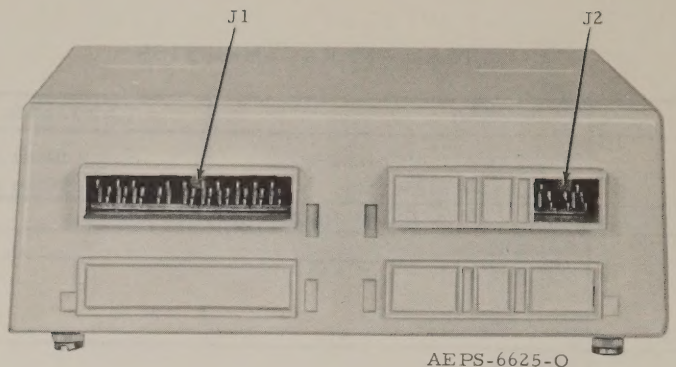
NOTE

For instructions pertaining to multiple option installations, refer to the Installation Instructions supplied with the housing assembly.

To add "Channel-Scan" monitor capability, refer to Figures 1 and 2 and proceed as follows:

CAUTION

These "Channel-Scan" monitor units can ONLY be used in NEGATIVE GROUND systems.



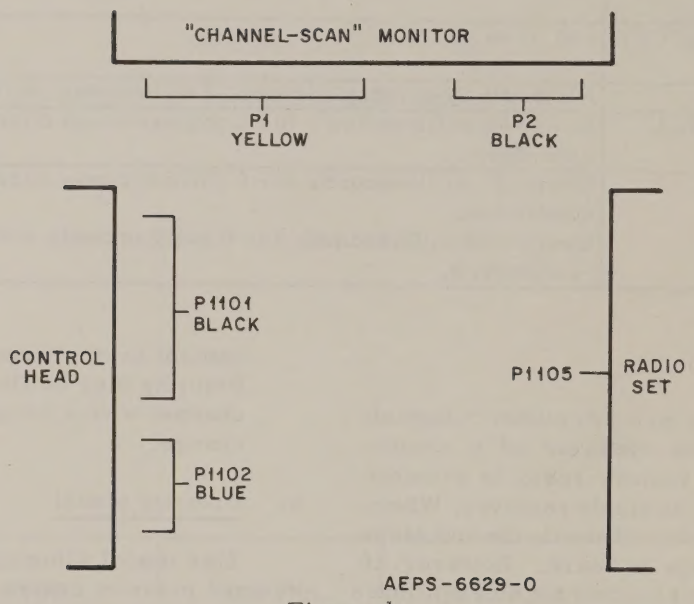


Figure 1.
"Channel-Scan" Monitor Plug and
Jack Location Detail

(1) Check jumper on circuit card connections as follows:

JUMPER CONNECTIONS (AS SHIPPED FROM FACTORY)

MODEL	JU1-JU8	WHITE	RED
Priority Model	All Connected	To "PS" Post	To "S" Post
Non-Priority Model	All Removed	To "S" Post	

OPTIONAL JUMPER CONNECTIONS

MODEL	JU1-JU8	WHITE	RED
Priority Model	All Connected	To "PS" Post	To "S" post if control head frequency selector switch determines transmitter frequency. To post "1" for fixed channel 1 transmit To post "2" for fixed channel 2 transmit To post "3" for fixed channel 3 transmit To post "4" for fixed channel 4 transmit
Non-Priority Model	All Removed	To "S" post for control head frequency selector switch to establish priority. To post "1" for fixed channel 1 priority To post "2" for fixed channel 2 priority To post "3" for fixed channel 3 priority To post "4" for fixed channel 4 priority	

(2) Peel the paper backing from the escutcheon and press into place on the front of the "Systems 90" accessory housing.

(3) When the "Channel-Scan" monitor unit is used with 2- or 3-frequency radios, the unused pushbutton switches must be "pinned" as shown in Figure 2.

NOTE

With priority select Model TLN1387A, to prevent false lamp indication, the corresponding jumper JU1-JU4 must be cut for unused station (see schematic diagram). To expand later, this jumper must be replaced in addition to removing the stop.

- Pull the applicable pushbutton plastic cover straight off. A screwdriver may be carefully used to give added leverage.
- Install the supplied plastic pushbutton stop.
- Push cover back onto pushbutton switch.

CAUTION

Be sure not to close the switch when replacing the cover. Hold the little male slider pin that protrudes from the rear of the switch and push the cover on. This pin is "in" when the switch is "open".

(4) Slide the circuit card completely into the housing assembly.

(5) Install the rear housing cover and secure with two captive screws.

(6) Disconnect the black connector (P1101) from the control head.

(7) Use the contact removal tool to remove eight wires, with pins attached, from P1101 (black) as follows:

- Yellow wire from position 1.
- Black-violet wire from position 9.
- Brown center conductor of red shielded cable from position 17.
- Violet wire from position 2. This wire must be taped back unless multiple "Private-Line" or Single-Tone Encoder are present (refer to master interconnect sheet).

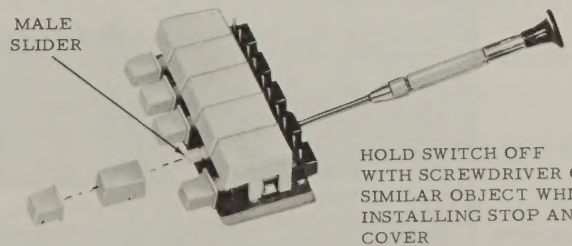

MALE SLIDER
HOLD SWITCH OFF WITH SCREWDRIVER OR SIMILAR OBJECT WHILE INSTALLING STOP AND COVER
PUSHBUTTON COVER
PLASTIC STOP
AEPS-6743-O

Figure 2.

- Shield of red cable from position 10.
- Black-green wire from position 20.
- Shield wire from position 21.
- Black-orange wire from position 22.
- Orange wire from position 13.

NOTE

Steps (8) and (9) are for early model cables only. Later models have 5 inches already stripped (with two plastic straps which may have to be cut).

(8) Remove the "S" clamp from the end of the multiconductor cable and move the strain relief back about 3 inches.

(9) Cut approximately 3 inches of sleeving off of the cable. Avoid cutting the insulation of any wires.

(10) Insert the pins and wires which were removed from P1101 into the yellow connector (P1) as follows:

- Brown center conductor of red shielded cable into position 3.
- Shield of red cable into position 13.
- Black-green wire into position 21.
- Shield wire into position 22 (w/clear sleeving).
- Black-orange wire into position 20.

(11) Insert the pins and wires which were removed from P1101 into the black 5-pin connector (P2) as follows:

- Yellow wire into position 3.
- Black-violet wire into position 6.
- Orange wire into position 4.

(12) Insert the pins and wires connected from P1 into P1101 as follows:

- Black-violet wire into position 9.
- Center conductor of black (white jacket) shielded wire into position 17.
- Shield of black cable into position 10.
- Black-green wire into position 20.
- Violet-black wire into position 21.
- Black-orange wire into position 22.
- Black-white wire into position 5.

(13) Insert the pins and wires connected from P2 into P1101 as follows:

- Yellow wire into position 1.
- Orange wire from P2-1 into position
- Orange wire from P2-4 to ignition switch (with fuse).

NOTE

Except for the low and high band "Micor" radio set models equipped with a wide-spaced receiver option, any four frequencies can be selected to be scanned. For the low and high band wide-spaced receiver models, only the first four frequencies (F1-F4) can be scanned. The second group of four frequencies (F5-F8) cannot be scanned. In non-priority select models TLN1388A, the monitor will scan the four frequencies selected as non-priority frequencies. The priority frequency scanned is chosen by the control head selector switch. If the priority channel selected is other than the four non-priority frequencies, the system effectively becomes a five frequency scanning system.

(14) Using the contact removal tool, remove the pins corresponding to the frequencies to be scanned from P1102 (blue).

(15) Insert the pins which were removed from P1102 (blue) into P1 (yellow) as follows:

- Connect the pin for the first frequency to be scanned to pin 19.
- Connect the pin for the second frequency to be scanned to pin 12.
- Connect the pin for the third frequency to be scanned to pin 17.
- Connect the pin for the fourth frequency to be scanned to pin 16.

(16) Connect a lead between P1 (yellow) of the "Channel-Scan" monitor and P1102 (blue) as follows:

- Connect the lead for the first frequency to be scanned between pin 8 of P1 and the pin of P1102 corresponding to the first frequency.

● Connect the lead for the second frequency to be scanned between pin 7 of P1 and the pin of P1102 corresponding to the second frequency.

● Connect the lead for the third frequency to be scanned between pin 6 of P1 and the pin of P1102 corresponding to the third frequency.

● Connect the lead for the fourth frequency to be scanned between pin 5 of P1 and the pin of P1102 corresponding to the fourth frequency.

(17) Reconnect P1101 and P1102 to the control head and connect P1 and P2 to receptacles J1 and J2, respectively, on the rear of the "Channel-Scan" monitor circuit card.

b. Required Control Head Field Modifications

The "Micor" control head must be modified to work with the "Channel-Scan" monitor unit as follows:

(1) Remove the top cover of the control head by loosening the two "Phillips" head captive screws on the bottom and lifting the top off.

(2) Using a pair of long-nose pliers, carefully pull the black-white wire attached to the wiper of the frequency switch off the male pin on the P. C. Board. Be sure to grasp the wire by the female connector.

(3) Route this wire across to P1101 (black) and push the connector onto PIN 5.

(4) Reinstall the top cover.

c. Factory Wired

When the "Channel-Scan" monitor is purchased as a part of a radio system, the wiring changes will have been completed. The individual system components are shipped with all interconnecting cables attached, to permit a thorough system checkout before unpacking.

(1) Install the radio and cabling as directed in the radio installation instructions.

(2) Connect the black (P1101) and blue (P1102) connectors to the control head.

(3) Connect the yellow (P1) and black (P2) to the "Channel-Scan" monitor unit at J1 and J2, respectively.

3. OPERATING PROCEDURE

a. General

The operator controls on the "Channel-Scan" monitor consist of five pushbutton switches as shown in Figures 3 and 4. The SCAN on-off switch turns the unit on. The "NP" channel select switches (non-priority model only) select the desired non-priority channels (any number may be pushed in at the same time). The "P" channel select switches (priority model only) select the desired priority channel (only one at a time). Any "NP" or "P" channel select switches not used in a particular system are "pinned" and cannot be pushed.

Other controls used while operating the "Channel-Scan" unit are the SQUELCH and VOLUME controls on the control head.

b. Control Head Adjustments

(1) With the SCAN on-off switch on the monitor unit to the off position (out), turn the SQUELCH control fully counterclockwise.

(2) Turn the VOLUME control clockwise until noise is heard from the speaker.

(3) While no signal is being received, slowly turn the SQUELCH control clockwise until the noise just squelches (cuts out). This is the threshold squelch condition and gives the most sensitive performance of the "Channel-Scan" monitor and radio units.

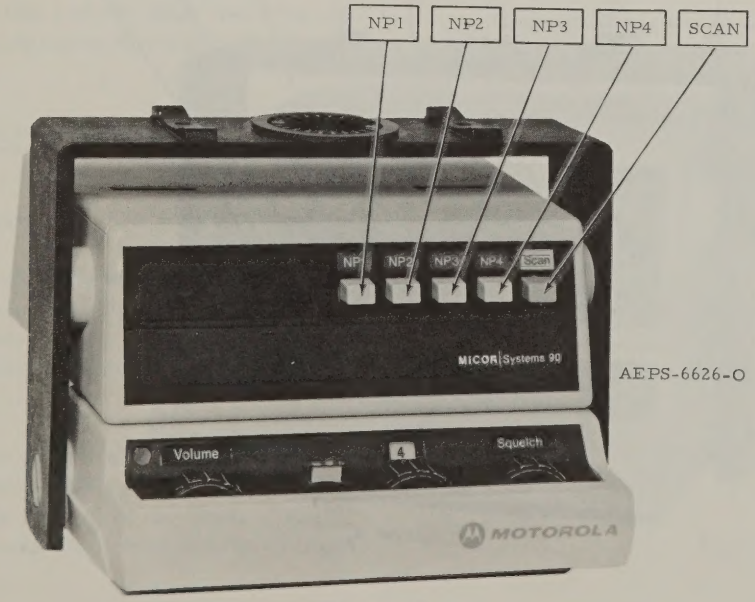


Figure 3.

(4) With a signal being received, adjust the VOLUME control for a comfortable listening level.

c. Non-Priority Model Operation

(1) Press the applicable "NP" channel selector switch for each channel desired to be monitored.

(2) Press the SCAN on-off switch. All "NP" channel indicator lamps will illuminate and the first signal received on one of the non-priority channels selected will be heard from the speaker. The indicator lamp for this channel will become brighter and pulse to indicate continued sampling.

If the channel indicator lamps flicker sporadically without locking on a channel, advance the squelch control slowly until flickering just ceases to insure continuous scanning.

NOTE

As shipped from the factory, the non-priority model has a priority channel which follows the control head frequency selector switch. A signal received on this priority channel will be heard from the speaker regardless of its selector switch position. The indicator lamp for the priority channel will become brighter and will not pulse.

(3) To stop scanning, press the SCAN on-off switch again to return it to its off (out) position. Scanning action will cease and the channel indicator lamps will turn off. Complete operational control reverts back to the control head (if the transmit channel element driver output is connected to the [S] post). Readjust the squelch control for desired sensitivity.

d. Priority Model Operation

(1) Press the applicable "P" channel selector switch for which priority monitoring is desired. All remaining channels are automatically given non-priority status.

(2) Press the SCAN on-off switch. All "P" channel indicator lamps will illuminate and the first signal received will be heard from the speaker. If this is a non-priority channel, the indicator lamp for the monitored channel becomes brighter and pulses to indicate continued sampling. A signal on the priority channel is automatically heard from the speaker whether messages are present on other channels or not, and the priority channel indicator lamp becomes brighter and does not pulse.

NOTE

Field modifications may have been made to the unit to "fix" priority to one channel, regardless of the channel select switches status.

(3) To stop scanning, press the SCAN on-off switch again to return it to its off (out) position. Scanning action will cease and the channel indicator lamps will turn off. With the monitor off or when transmitting, complete operational control reverts back to the control head (if the transmit channel element driver output is connected to the [S] post). Readjust the squelch control for desired sensitivity.

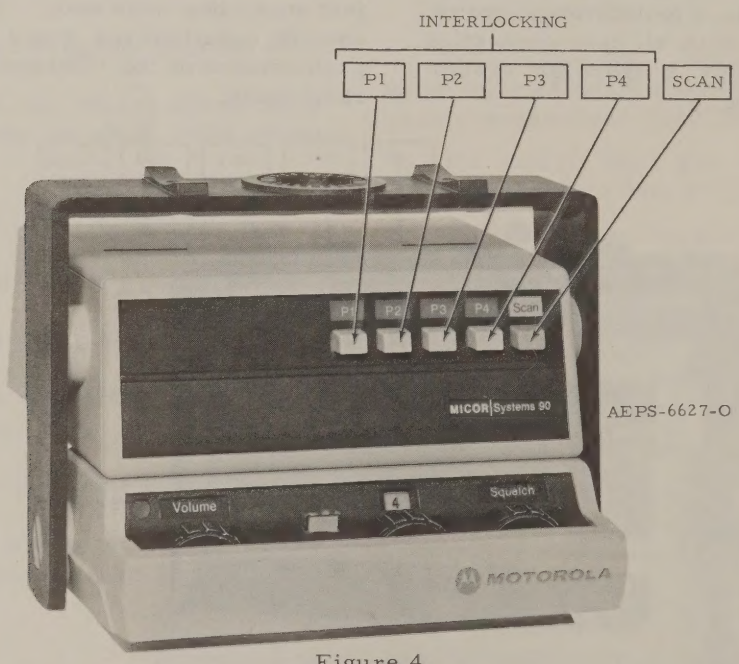


Figure 4.

4. THEORY OF OPERATION

a. General

Both the non-priority and priority model "Channel-Scan" units monitor non-priority and priority channels. Specific channel non-priority or priority status is determined by internal scan unit jumper connections and the channel select pushbutton switches, or the control head frequency selector switch. As shipped from the factory, non-priority is selectable with the non-priority model while priority is selectable with the priority model.

Once priority status is determined, the channels are scanned in sequence until a carrier is received. The unit will then stop scanning and lock onto that channel if it is a priority channel. If it is a non-priority channel, it will lock onto that channel but will continue to sample the priority channel four times a second to ensure the complete reception of all priority channel messages. If a non-priority signal was being received when a priority signal arrived, the unit will revert to that same non-priority channel when the priority signal disappears. Normal sequential scanning resumes when no signals are present.

When a channel is "scanned" or "sampled", a ground is applied to its particular receiver channel element from the scan unit. This enables the channel element which, in effect, turns that receiver channel on. If there is no signal on that channel, the scan unit then ungrounds the channel element, inhibiting that channel, and sequentially, enables the next channel searching for an on channel signal.

The following discussion describes circuit operation during no signal input conditions and received signal input conditions. Refer to the schematic diagram at the end of this section as well as the "in text" diagrams during the following discussion.

b. No On-Channel Signal Condition

(1) Squelch IC1
(Refer to Figure 5.)

The "Channel-Scan" monitor unit receives its input from the arm of the squelch control in the associated control head. This allows the noise input level to be adjusted to the desired threshold level.

While there is no on-channel signal, the input noise level to squelch IC1-15 is high which causes its output at pin 10 to be a logic "high" (5 V dc). Figure 6 shows the relationship of input

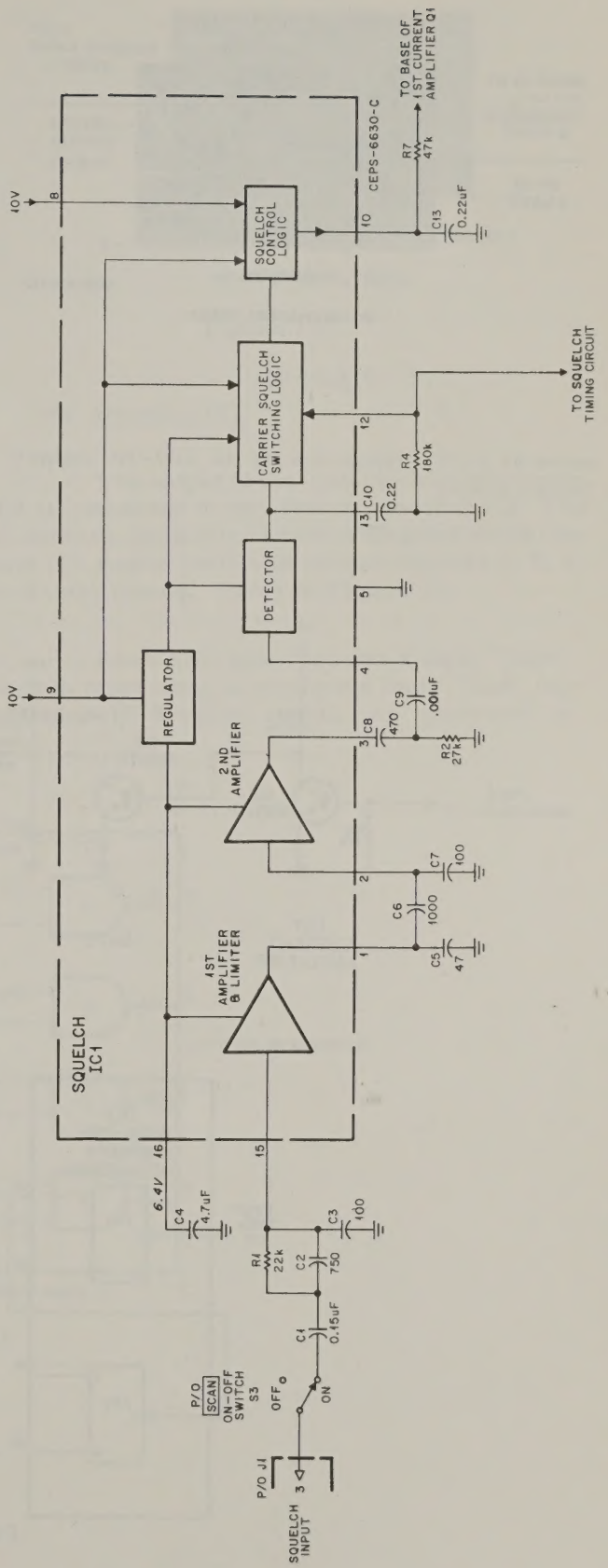


Figure 5.

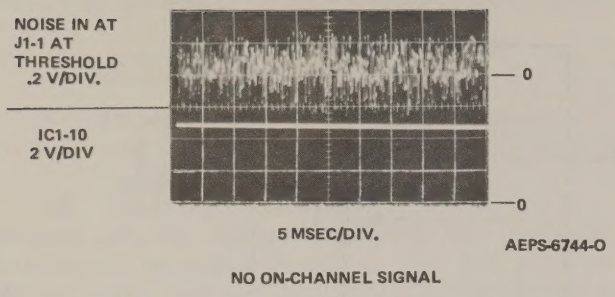


Figure 6.

noise at J1-1 (upper trace) to IC1-10 output (lower trace).

(2) 1st Current Amplifier, Gate, Gate Driver, Gate, and High-Speed Clock Multivibrator

Refer to Figure 7. While IC1-10 is "high" first current amplifier Q1 is conducting, gate Q3 is cut off, gate driver Q4 and gate Q5 are conducting. This provides an emitter ground to Q6 through Q5 which enables the high-speed clock multivibrator Q6 and Q7. This multivibrator runs with a period of approximately 12-14 milliseconds (a pulse lasts approximately 6-7 milliseconds). These pulses are routed to non-priority binary counter IC2.

(3) Non-Priority Binary Counter IC2

Refer to Figure 8. Integrated circuit IC2 is a dual flip-flop binary counter with one input

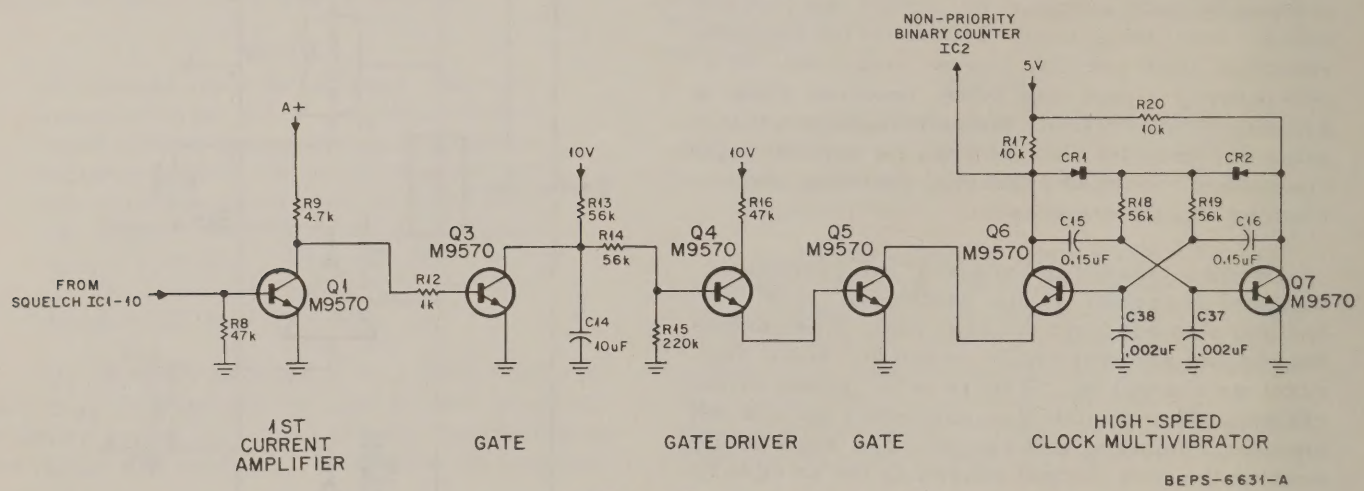


Figure 7.

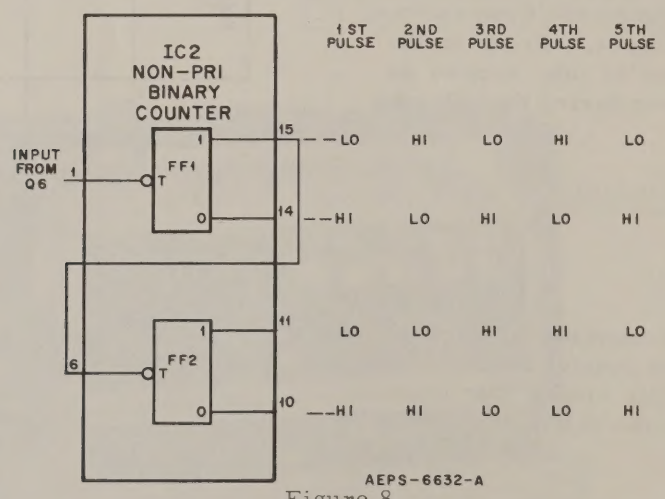


Figure 8.

and four outputs. As connected, four unique output states occur, in sequence, as pulses are applied to pin 1 from the high-speed clock multivibrator.

IC2 input relationships are shown in Figures 9 and 10. The top waveform of Figure 9 shows input pulses arriving at pin 1. The bottom waveform shows resulting output pulses at pin 15. The top waveform of Figure 10 shows input pulses to pin 6 while the bottom waveform shows output pulses at pin 11.

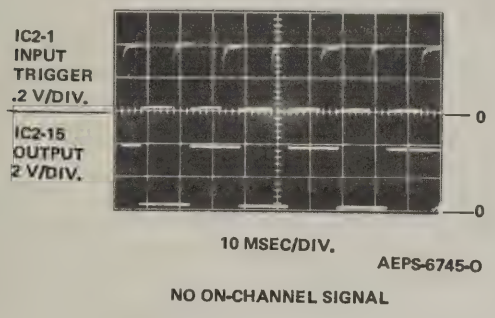


Figure 9.

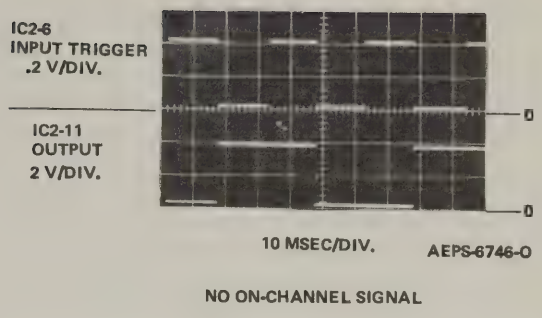


Figure 10.

(4) Decoder IC3

The output of non-priority binary counter IC2 is connected to non-priority decoder IC3. This IC consists basically of four AND gates which convert IC2 output combinations into channel 1, 2, 3, or 4 intelligence. Refer to Figure 11.

Each AND gate requires a logic "high" on both input leads to produce a logic "high" (approximately 5 volts) output. As connected to

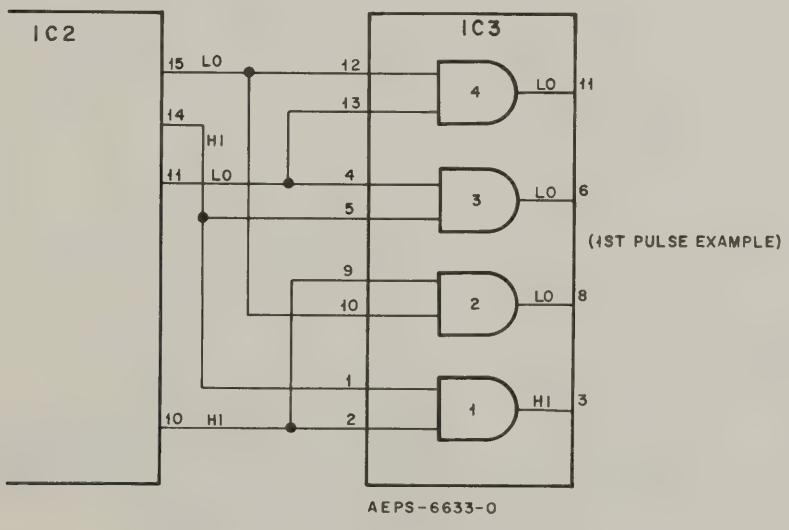


Figure 11.

non-priority binary counter IC2, only one AND gate can receive both logic "highs" at any one time. Therefore, one AND gate has a logic "high" output while the remaining three AND gates have logic "low" (approximately 0 volts) outputs. The logic output states shown in Figure 11 illustrate a first received pulse condition. As shown in Figure 8, a second pulse causes IC2-15 and -10 only to go high. IC3 AND gate 2 is connected to IC2-15 and -10 and therefore is the only AND gate with a "high" output due to the reception of the second pulse.

(5) Lamp and Non-Priority Channel Element Driver IC4

The output of non-priority decoder IC3 is applied to the lamp and non-priority channel element driver IC4. This IC consists basically of four dual input NAND gates--two input "highs" are required to produce a "low" output. Each NAND gate is connected to one output from decoded IC3 and to non-priority inhibit switch Q22. Refer to Figure 12.

While there is no on-channel message, a logic "high" appears on IC4-2, -5, -10, and -13 from non-priority inhibit switch Q22. When a logic "high" arrives from decoder IC3, the associated IC4 NAND gate provides a logic "low" output.

Refer to Figure 13. A logic "low" from one of the four IC4 output terminals: (1) activates the associated receiver channel element by grounding it, and (2) allows the associated channel indicator lamp to become brighter.

For example, a logic "low" at IC4-3 is routed through non-priority select switch NP1 if closed (non-priority model) or via jumper JU1 (priority model) to the F1 receiver channel element in the radio set. The "low" is also routed through diode CR3 to lamp driver inhibit switch Q8 which grounds the emitter. Q8 will remain off, however, until bias drive is supplied from the collector of 1st current amplifier Q1 which occurs during on-channel message conditions. When Q8 conducts, bias drive is supplied to lamp driver Q12 which, in turn, provides a low resistance current path around resistor R36 to lamp DS1. The lamp then becomes brighter. IC4 pins 6, 8, and 11 are used with F2, F3 and F4 receiver channel elements, and Q9, Q10, and Q11 lamp driver inhibit switches respectively.

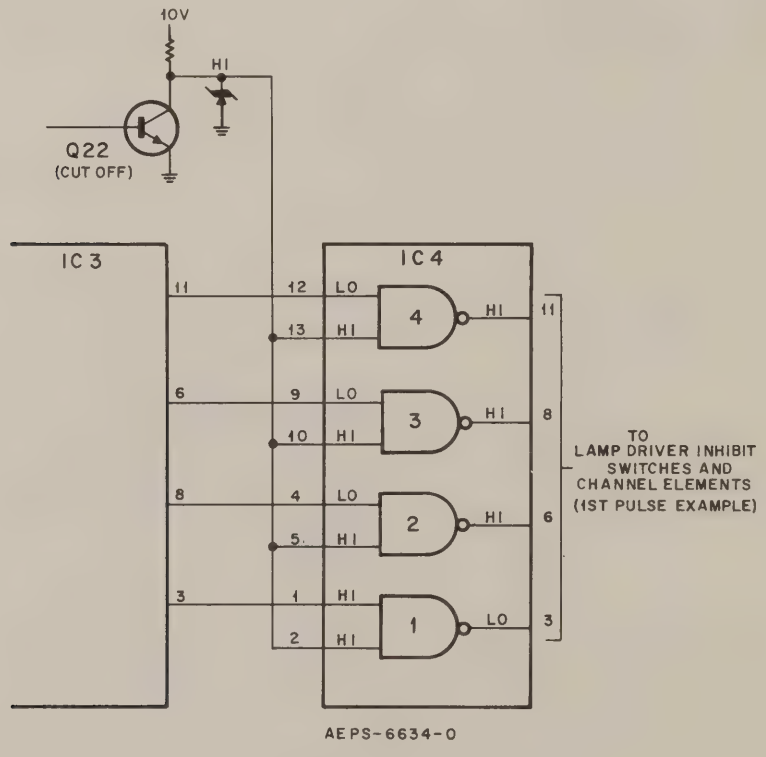


Figure 12.

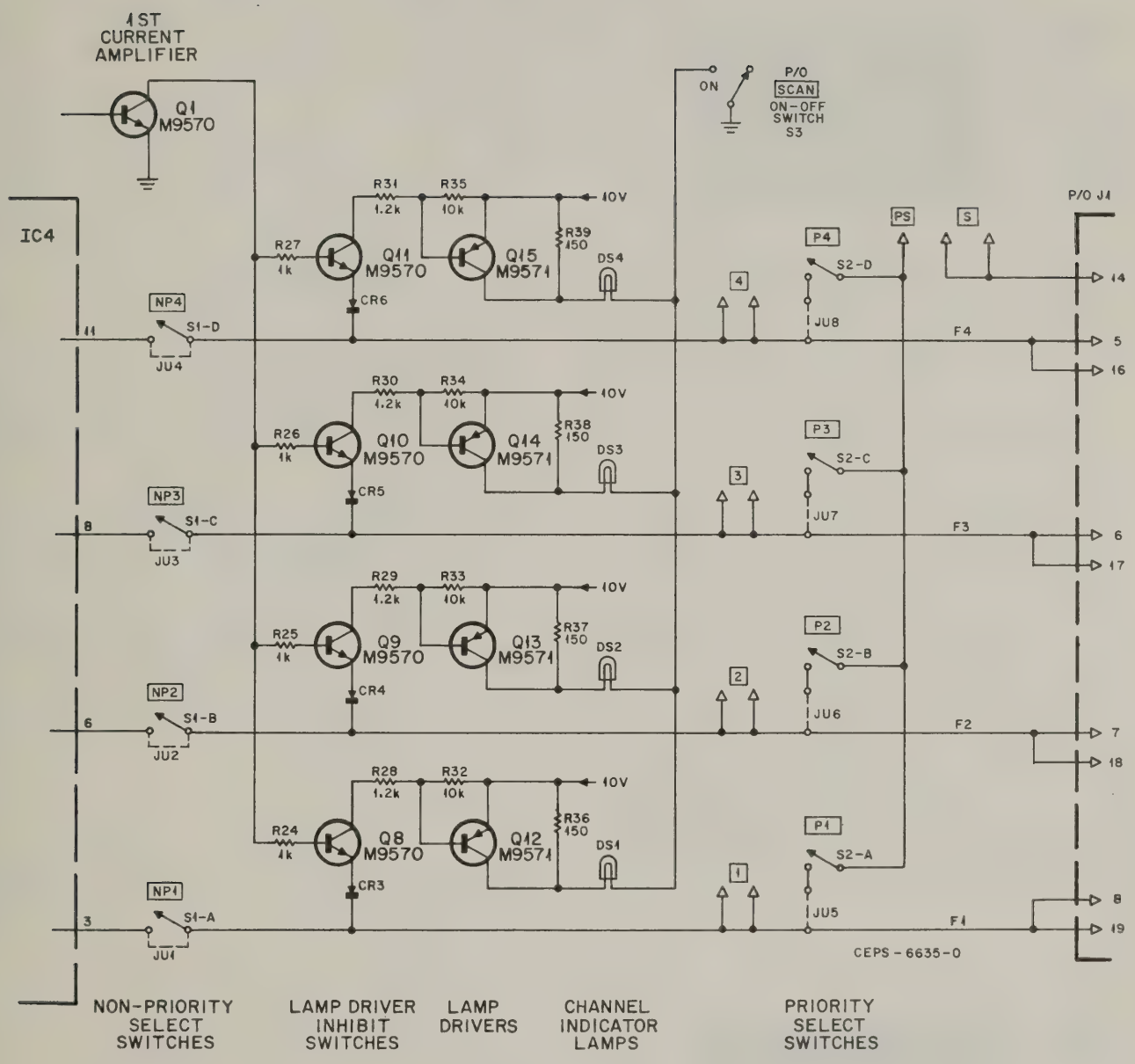

1ST CURRENT AMPLIFIER
Q1 M9570
IC4
P/O SCAN ON-OFF SWITCH S3
ON
P/O J1
PS
S
R31 1.2k
R35 10k
10V
R27 1k
Q11 M9570
Q15 M9571
R39 150
DS4
CR6
NP4
S1-D
JU4
11
P4
S2-D
JU8
F4
14
5
16
R30 1.2k
R34 10k
10V
R26 1k
Q10 M9570
Q14 M9571
R38 150
DS3
CR5
NP3
S1-C
JU3
8
P3
S2-C
JU7
F3
6
17
R29 1.2k
R33 10k
10V
R25 1k
Q9 M9570
Q13 M9571
R37 150
DS2
CR4
NP2
S1-B
JU2
6
P2
S2-B
JU6
F2
7
18
R28 1.2k
R32 10k
10V
R24 1k
Q8 M9570
Q12 M9571
R36 150
DS1
CR3
NP1
S1-A
JU1
3
P1
S2-A
JU5
F1
8
19
CEPS-6635-0
NON-PRIORITY SELECT SWITCHES
LAMP DRIVER INHIBIT SWITCHES
LAMP DRIVERS
CHANNEL INDICATOR LAMPS
PRIORITY SELECT SWITCHES

Figure 13.

The top waveform in Figure 14 shows the output pulses that occur on the collector of Q7 while no signal is being received. The bottom waveform shows a non-priority channel element being "activated" during no signal input conditions and can be found at any IC4 output pin.

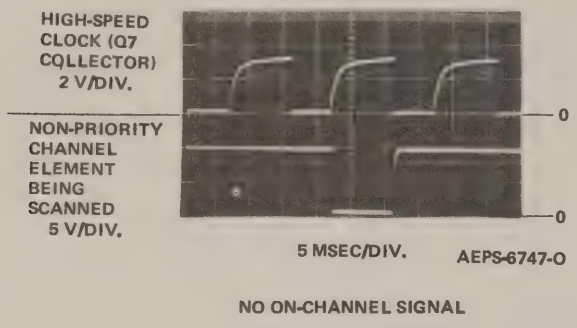


Figure 14.

c. On-Channel Signal Condition

(1) Squelch IC1
(Refer to Figure 15.)

When an on-channel message is received, receiver noise output is reduced. When the received signal strength is above the reference level established by setting of the control head squelch control, the output from IC1-10 is at a logic "low". The upper trace of Figure 16 was taken at J1-1. It illustrates receiver quieting due to the reception of an on-channel signal. The lower trace shows IC1 output at pin 10 dropping to a logic "low" (0 volts), when the signal is received.

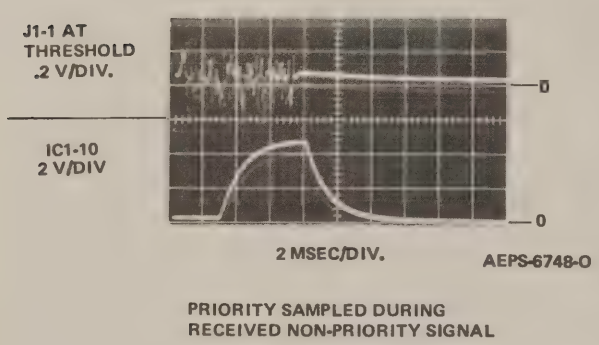


Figure 16.

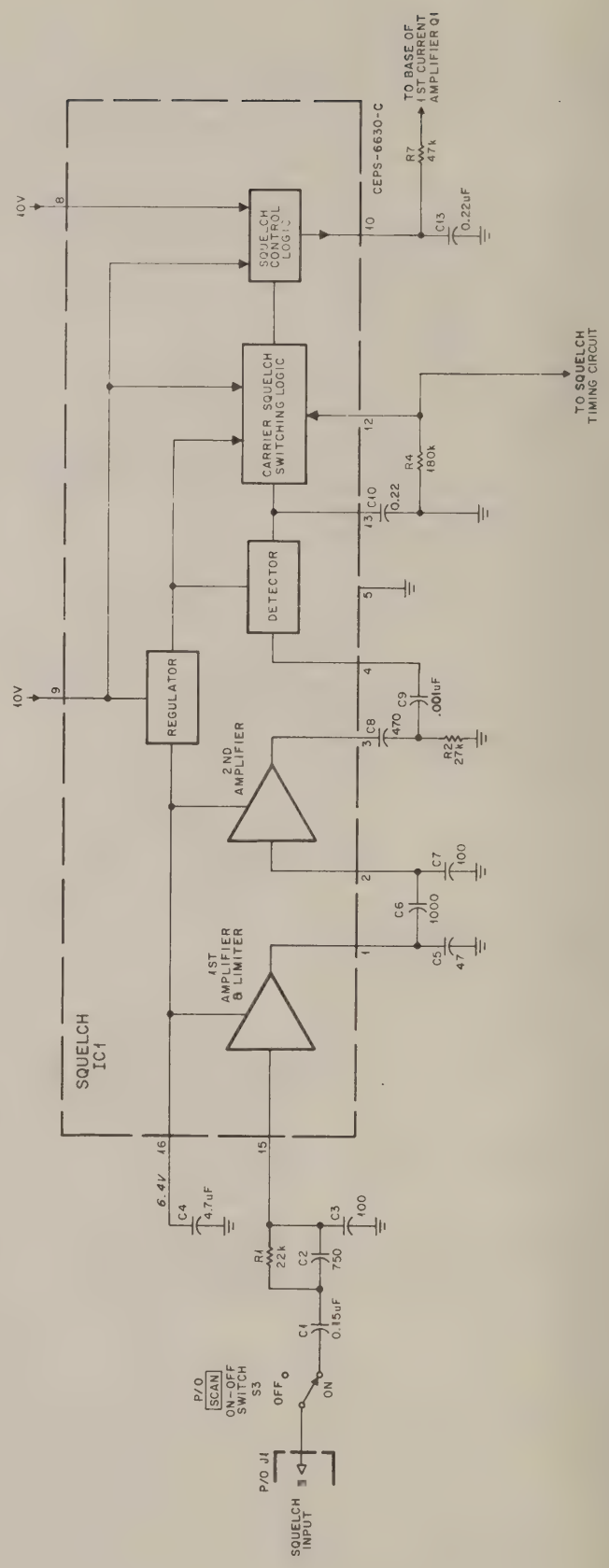


Figure 15.

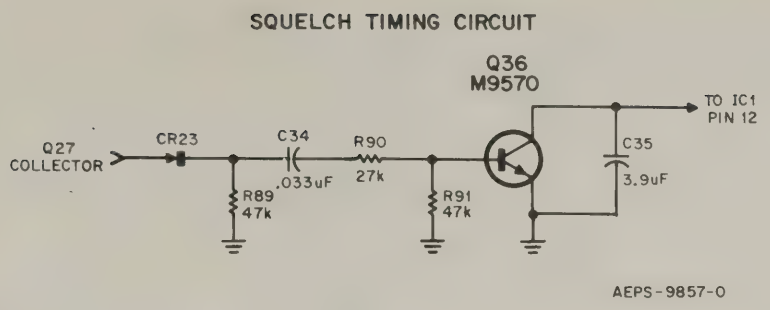


Figure 17.

(2) Squelch Timing Circuit
(Refer to Figure 17.)

This circuit is used on later version printed circuit boards and is contained on a small vertical printed circuit board assembly, Motorola Part No. 1V80733B88.

Pin 12 of IC1 is connected to a circuit within the squelch integrated circuit which has the ability to distinguish between weak and strong signals. When a weak signal is detected (a signal less than 20 dB quieting) the voltage on pin 12 rises to about 5.0 volts, charging C35. This charge on C35 causes a long squelch drop-out or "squelch tail" to prevent loss of signal on fades.

This long squlech response on weak signals cannot, however, be tolerated when sampling priority in the presence of a weak non-priority signal. The long response time would cause an unacceptably large "hole" to be cut in the non-priority message. It is for this reason that transistor Q36 and its associated circuitry is provided to rapidly discharge C35 when sampling priority.

When the priority sampling monostable begins its cycle, the collector of Q27 goes positive. A positive pulse is coupled from this collector through isolation diode CR23, capacitor C34, and resistor R90 to the base of Q36. Q36 turns on, shorting capacitor C35 to ground, rapidly discharging it. The time constant of C34-R90 is set so that the grounding is applied for approximately 3 milliseconds. This allows time for the squelch to respond to the new channel being looked at, but is short enough to allow activation of the long squelch tail feature if a weak signal is detected on priority. Resistor R89 allows capacitor C34 to discharge between samples.

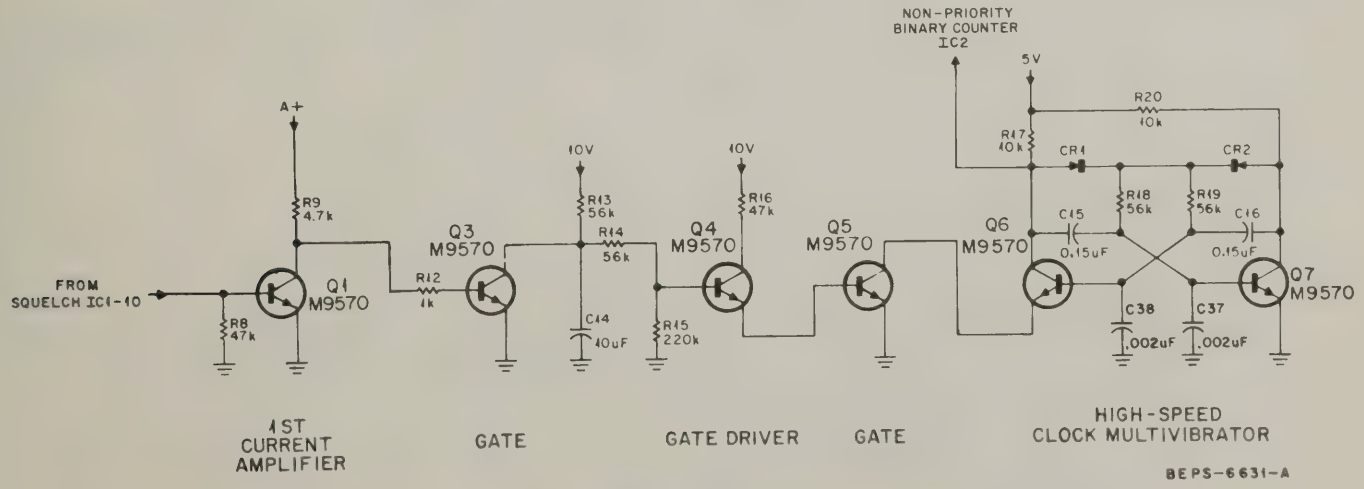


Figure 18.

(3) 1st Current Amplifier, Gate, Gate Driver, Gate, and High-Speed Clock Multivibrator
(Refer to Figure 18.)

While IC1-10 is "low", first current amplifier Q1 is cut off, gate Q3 is conducting, gate driver Q4 and gate Q5 are cut off. This disables the high-speed clock multivibrator Q6 and Q7 by removing the emitter ground to Q6. While the high-speed clock multivibrator is inhibited, binary counter IC2 stays in the state created by the last input pulse and further non-priority channel scanning is prohibited. With the non-priority channel model, the message will be heard if the associated channel select pushbutton switch is closed. With the priority model, the message will be heard unless there is a message on another channel which has priority. A delay network is used to prevent the resumption of non-priority channel scanning should a received signal be lost or "fade" for less than approximately 150 milliseconds. When a received signal is lost, gate Q3 stops conducting immediately and capacitor C14 begins to charge. After approximately 150 milliseconds, C14 is charged sufficiently to forward bias Q4 and Q5, the high-speed clock multivibrator is enabled, and scanning resumes. This is illustrated in Figure 19. The bottom waveform shows the output at IC1-10 going from a logic "low" (low noise -- on-channel signal received) to a logic "high" (loss of signal). The top waveform taken at Q7 collector shows by comparison that scanning resumes approximately 150 milliseconds after the loss of the signal.

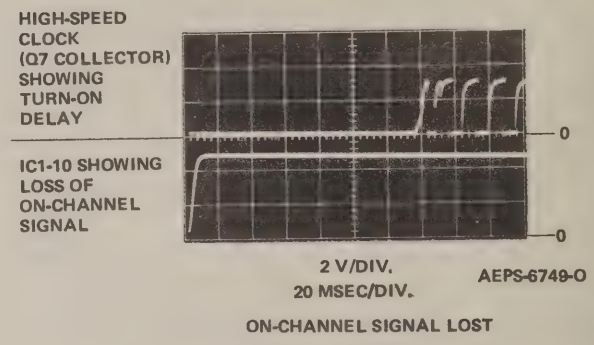


Figure 19.

(4) Slow-Speed Clock Inhibit Switch
(Refer to Figure 20.)

This switch (Q16) inhibits the output of the slow-speed clock multivibrator (Q23 and Q24)

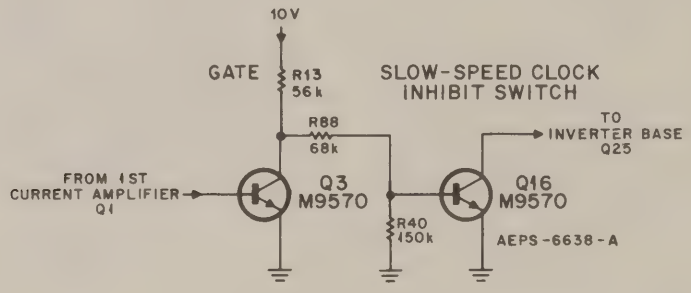


Figure 20.

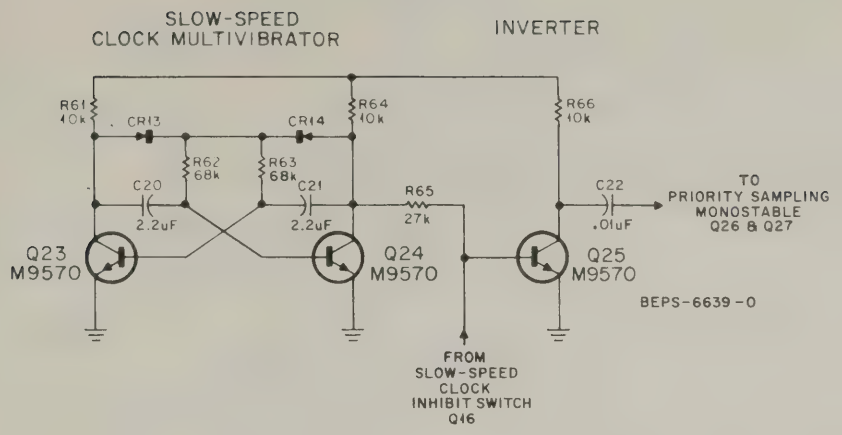


Figure 21.

at the base of inverter Q25 while no on-channel message is being received. The base of Q16 is connected to the collector of gate Q3. While no on-channel message is being received, Q3 is cut off and Q16 is conducting, grounding the output of Q24. When an on-channel signal is received, Q16 cuts off and slow-speed clock pulses are passed to inverter Q25.

(5) Slow-Speed Clock Multivibrator and Inverter
(Refer to Figure 21.)

The slow-speed clock multivibrator (Q23 and Q24) generates pulses at the rate of 4 per second. These pulses are used to cause priority channel sampling while a message is being received on a non-priority channel. Output pulses, if not grounded by the slow-speed clock inhibit switch Q16, are inverted by Q25 and passed to the priority sampling monostable Q26 and Q27.

(6) Priority Sampling Monostable

The priority sampling monostable converts the positive pulses from Q25 into 6-7 millisecond duration positive pulses. Refer to Figure 22.

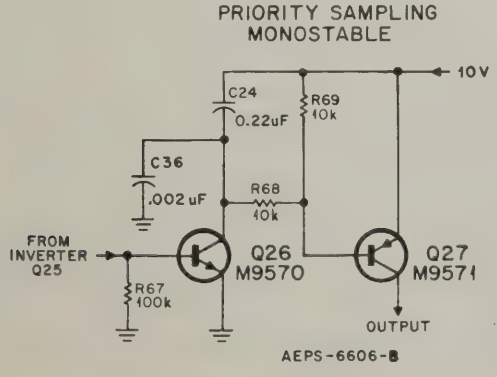


Figure 22.

The monostable consists of transistors Q26 and Q27 with associated circuitry. Q26 conducts for the duration of a positive pulse from Q25. Capacitor C24 and resistor R68 form a voltage decay delay network that causes Q27 to conduct for approximately 6-7 milliseconds after Q26 is cut off. When Q27 conducts, its collector voltage is "high". Since a triggering pulse arrives at the input to the monostable at the rate of 4 times a second, a "high" is present on the collector of Q27 for 6-7 milliseconds every 250 milliseconds (during non-priority message reception conditions). This "high" output is routed to four places--(1) non-priority inhibit switch Q22 (2) priority sampling mute switch Q30, (3) priority channel element drivers Q28 and Q29 and (4) priority detect gate Q21.

(7) Non-Priority Inhibit Switch

Non-priority inhibit switch Q22 disables the non-priority channel while the priority channel is being sampled, or when a priority signal is being received. This prevents the possibility of two channel elements being on at the same time which would cause spurious oscillations. Refer to Figure 23.

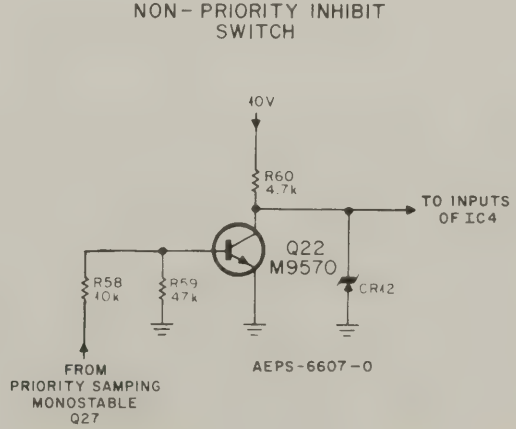


Figure 23.

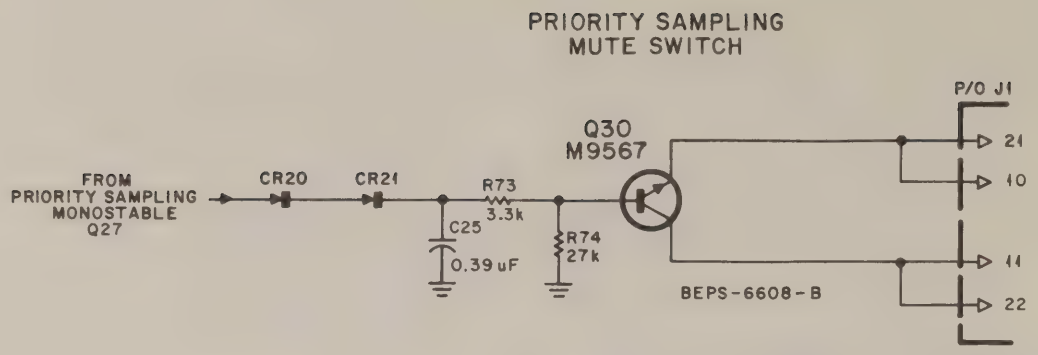


Figure 24.

When the priority channel is sampled, Q27 conducts and applies a "high" to the base of Q22 through resistor R58. This causes Q22 to conduct which grounds one input terminal of each NAND gate in IC4. Since an output "low" is required from a NAND gate to enable its associated non-priority channel and two input "highs" to the NAND gate are required to get a "low", grounding one input terminal inhibits non-priority channel element grounding.

(8) Priority Sampling Mute Switch

Priority sampling mute switch Q30 prevents a "blip" of noise from being heard each time the priority channel is sampled. Refer to Figure 24.

Q27 drives Q30 through diodes CR20 and CR21 and resistor R73. When the collector of Q27 goes "high", Q30 conducts and mutes receiver audio. Capacitor C25 "softens" the muting to minimize objectionable "popping" during priority sampling. C25 provides approximately 7 milliseconds of delay to Q30 turn off.

(9) Priority Channel Element Drivers
(Refer to Figure 25.)

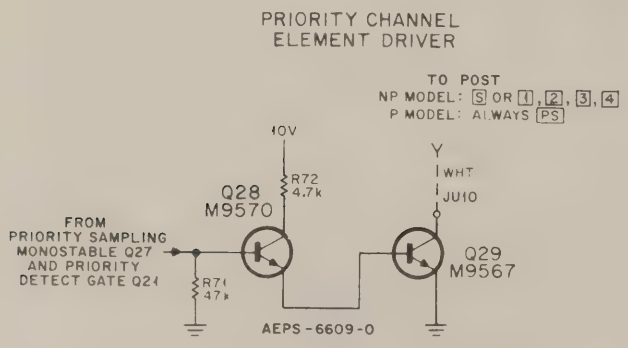


Figure 25.

Priority channel element drivers Q28 and Q29 provide a switched ground to enable the priority channel element. This occurs when the priority channel is "scanned" (a "high" on the collector of Q27) or when a message is received on the priority channel (a "high" on the collector of priority detect gate Q21).

(10) Priority Detect Gate

Priority detect gate Q21 is a NAND gate "looking" at squelch IC1 output and scanning status. When on-channel signal reception (IC1-10 "low") and priority sampling happen simultaneously, this circuit causes all scanning to stop and the receiver is locked onto the priority signal. Refer to Figure 26.

On-channel signals cause squelch IC1-10 to go "low". First current amplifier Q1 is cut off and second current amplifier Q2 is conducting. This applies a "low" through diode CR10 to the base of priority detect gate Q21. The second input to Q21 is via non-priority inhibit switch Q22 which has a "low" output while the priority channel is being sampled. The third input to Q21 is from off-transmit revert switch Q19 which is cut off unless the "Channel-Scan" monitor unit is off or the radio set is keyed. When Q2, Q22, and Q19 outputs are "low", Q21 is cut off and a "high" is routed through resistor R55 to priority channel element drivers Q28 and Q29 which turns them on. The priority sampling monostable turns the priority channel element drivers on to sample the priority channel. The priority detect gate holds the priority channel element drivers on once a priority signal is detected, until that signal disappears. During an on-channel non-priority condition, capacitor C32 delays the "high" output of Q2 by about 3 milliseconds. This will have no effect on the priority detect gate turn-on time.

A "high" output from Q21 also biases on slow-speed clock inhibit switch Q16 to inhibit further slow-speed pulses at the base of Q25; and turns on non-priority inhibit switch Q22 via resistor R57 to inhibit non-priority channel element grounding.

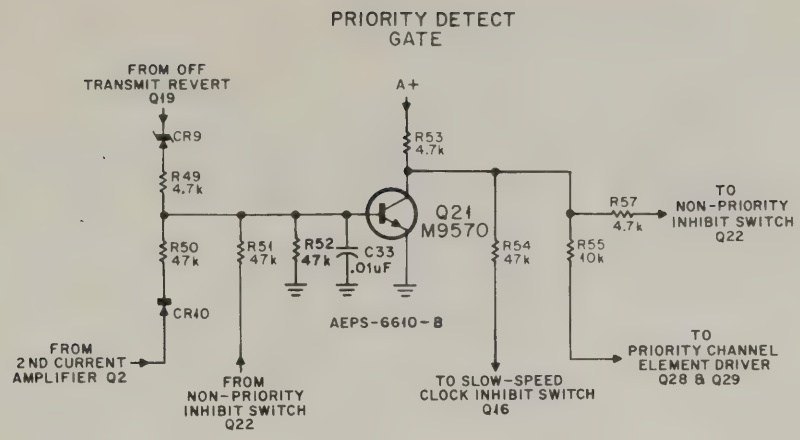


Figure 26.

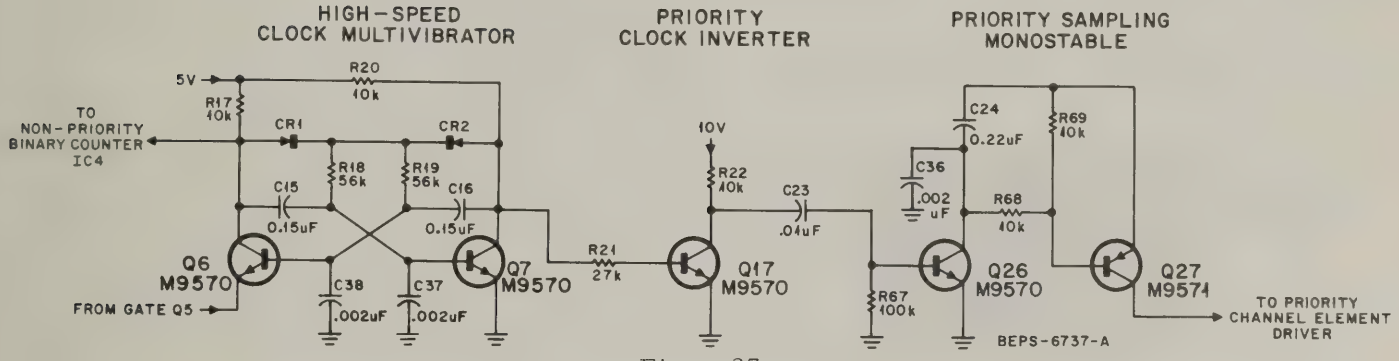


Figure 27.

(11) Priority Clock Inverter

While there are no on-channel signals, the high-speed clock multivibrator is running and non-priority channels are sampled. Priority clock inverter Q17 causes the priority channel to be sampled after a non-priority channel has been sampled. For example, the sampling sequence of a four-frequency radio with F3 priority is F1, F3, F2, F3, F3, F3, F4, F3, F1, F3, etc. Refer to Figure 27.

The high-speed clock multivibrator drives binary counter IC2 via the priority sampling monostable Q26 and Q27 through priority clock inverter Q17. When the collector of Q7 goes "low", Q17 is cut off. This causes capacitor C23 to charge positively through bias resistor R67 and forward biases Q26. When the collector of Q7 goes "high", Q17 conducts and Q26 is cut off. Non-priority inhibit switch Q22 is activated by Q27 when priority is sampled during the high or slow speed modes. This inhibits the non-priority channel to prevent the possibility of two channel elements being on at the same time.

(12) Noise Oscillator and Delay Gate

The noise oscillator (Q32 & Q33) keeps the receiver fully squelched to prevent a "buzzing" sound from being heard from the speaker while there is no on-channel signal. This is accomplished by generating artificial noise during the high speed scan rate, because the noise level is not sufficient to keep the receiver fully squelched. When the SCAN switch is on, the squelch input is routed to the "Channel-Scan" monitor circuits and the noise oscillator provides the squelch output to the radio. When the SCAN switch is off, the squelch input is routed directly to the radio. The delay gate (Q31) prevents the noise oscillator from squelching the radio set when the priority channel is sampled while a non-priority channel message is being received. Otherwise, a partial loss of non-priority message would result. Refer to Figure 28.

When an on-channel signal disappears, second current amplifier Q2 is cut off, charging C32, and its collector goes "high" after 3 milliseconds. After approximately 30 to 35

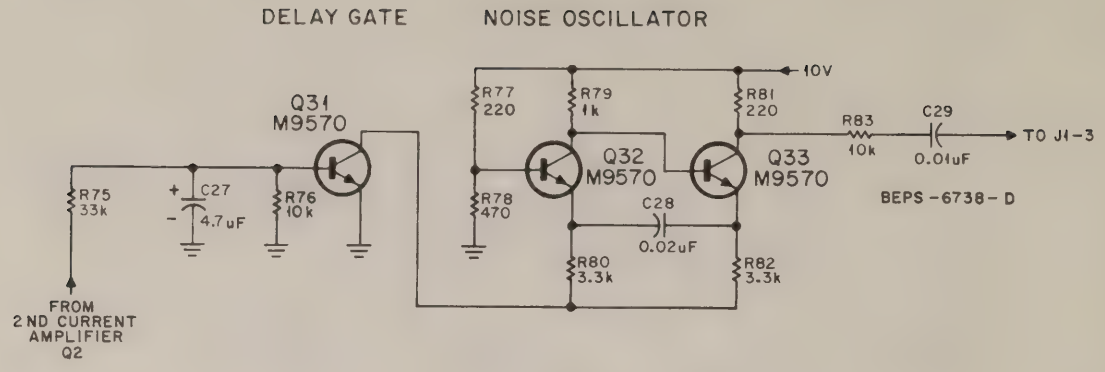


Figure 28.

milliseconds, capacitor C27 is charged sufficiently to forward bias delay gate Q31 which provides emitter grounds to Q32 and Q33 and the oscillator is enabled.

Figure 29 shows the noise oscillator output waveform present at J1-3 when no on-channel signal is being received.

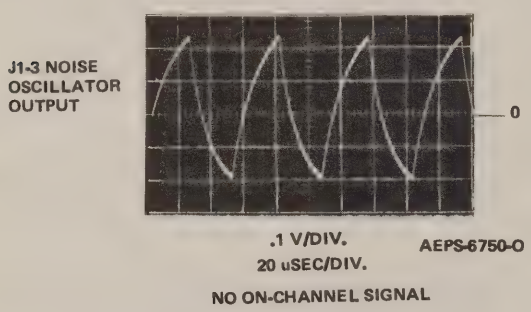


Figure 29.

Figure 30 illustrates noise oscillator turn-on delay. The bottom waveform shows squelch IC1-10 going from a logic "low" to a logic "high" when an on-channel signal is lost. Approximately 35 milliseconds later, the noise oscillator starts to oscillate as is shown in the top waveform, taken at J1-3.

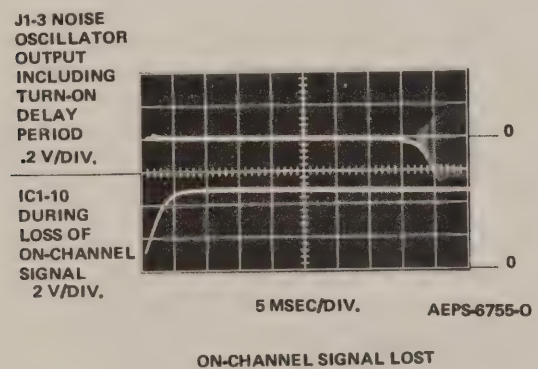


Figure 30.

(I3) Off-Transmit Revert Switch

This switch inhibits non-priority and priority element grounding, disables squelch, and causes transmitter channel element to be grounded when a P-T-T function is applied. When the SCAN switch is off, this switch performs these functions continuously. Refer to Figure 31.

When a ground is applied via the microphone P-T-T switch or the SCAN on-off switch, Q19 conducts which causes squelch inhibit switch Q18 to conduct and grounds the output of squelch IC1. This keeps the high-speed clock from running, and insures that the appropriate lamp will light by applying bias through resistors R24-R27.

Transmitter channel element driver Q20 turns on, which routes a ground through the RED jumper to the selected transmitter channel element. However, the transmitter channel element is not enabled until A+ is applied to it as well as the ground which is routed from the "Channel-Scan" monitor unit.

Non-priority elements are inhibited when Q19 goes "high" through diode CR11 and resistor R56. The priority element is inhibited through diode CR9 and resistor R49.

When transmitting or when "off" slow-speed pulses must be inhibited to prevent priority channel element grounding. This is accomplished when Q19 goes "high" through resistor R43 to slow-speed inhibit switch Q16.

5. MAINTENANCE

"Channel-Scan" maintenance can be broken down into two categories: in-system testing and bench testing. In-circuit testing is limited to comparing voltage measurements to those indicated on the schematic diagram but allows identification

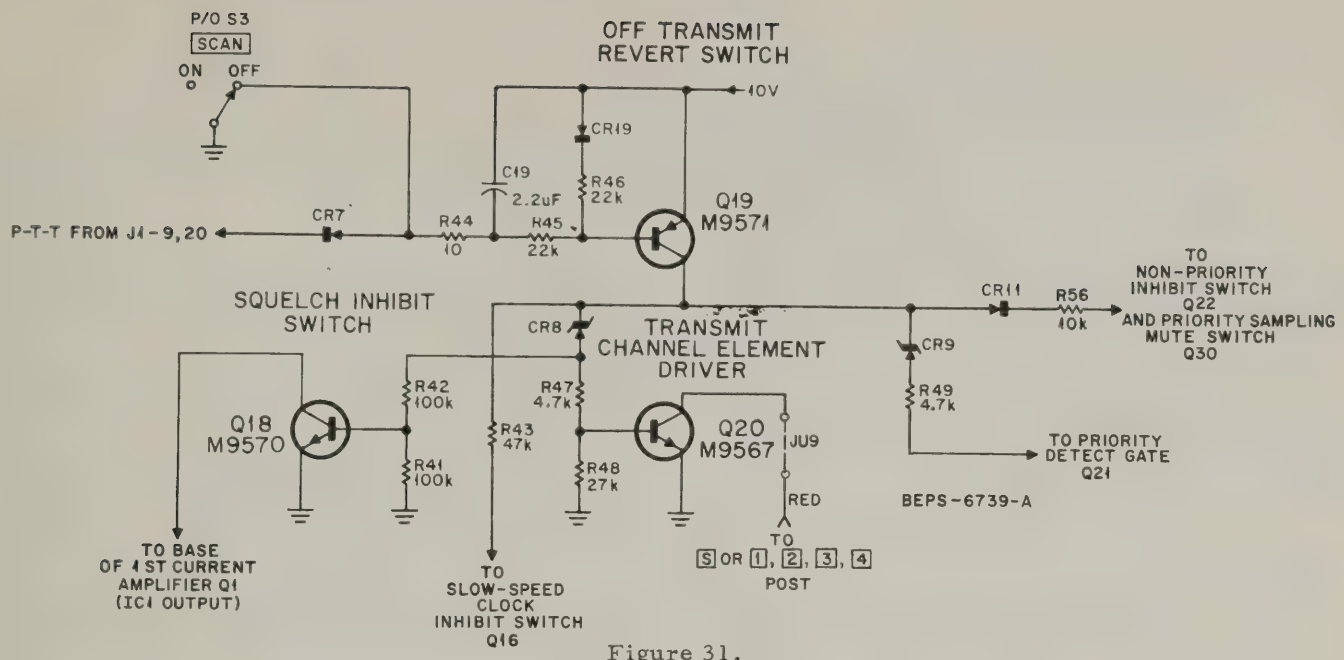


Figure 31.

of some malfunctions while still in the vehicle. Bench testing requires complete testing facilities but identifies those malfunctions not identifiable in the field.

Before repair is started on this circuit card, jumper status should be noted so that they can be returned to that state once servicing is completed.

a. In-System Testing

Making circuit voltage checks necessitates removing the circuit card from the housing assembly and is accomplished as follows:

(1) Disconnect the two connectors attached to the circuit card.

(2) Loosen the two captive screws securing the rear housing cover and remove the cover.

(3) Slide the circuit card out of the housing assembly and place the card atop the housing with the solder side up.

(4) Reconnect the two connectors (removed previously) to the proper location on the circuit card.

CAUTION

Do not allow the circuit card to come into contact with any metallic object which may cause damage from an accidental short circuit.

(5) Apply power to the system and proceed to take the necessary voltage measurements.

b. Bench Testing

A much more thorough check of the "Channel-Scan" circuit card can be performed on a test bench which has the proper test equipment.

(1) Test Equipment Required

DC power supply
FM signal generator with 6 dB pad
General purpose oscilloscope
Solid-state ac voltmeter
Solid-state dc voltmeter
Motorola Model S1057B Test Set
DC ammeter
"Micor" radio (4-frequency) with cable kit, speaker, control head, and appropriate channel elements

(2) Circuit Card Removal

Disconnect the two connectors from the rear of the circuit card.

Loosen the two captive screw securing the rear housing cover and remove the rear cover.

Slide the circuit card out of the housing assembly.

(3) Test Procedure
(Refer to Figure 32.)

(a) Equipment Set-Up and Current Check

1. Connect the "Micor" radio to the control head with its standard cable kit as shown in Figure 32. ("Channel-Scan" monitor circuit board is not connected at this time.)

2. Connect the power supply, speaker, rf signal generator, dc ammeter, microphone, ac voltmeter, and test set as shown in Figure 32.

3. Set up the test set as shown in Figure 32.

4. Slowly increase the power supply voltage to 13.8 V dc and note the ammeter reading.

5. Connect the "Channel-Scan" monitor unit as shown in Figure 32 and on the schematic diagram. Specific detailed wire connections are given in the installation paragraphs of this section.

6. Connect the "Channel-Scan" jumpers as follows:

MODEL	JUMPER		
	JU1-JU8	WHITE	RED
Priority	All Connected	To "PS" Post	To "S" Post
Non-Priority	All Removed	To "S" Post	To "S" Post

7. With SCAN off, slowly increase the power supply voltage to 13.8 V dc and note the ammeter reading. Subtract step 4. current reading from this current reading -- the difference should not exceed 180 milliamperes.

8. Press the SCAN switch once to turn the unit on and note the ammeter reading with the radio squelched (no noise heard from the speaker). Subtract step 4. current reading from this current reading -- the difference should not exceed 330 milliamperes.

9. With the "Channel-Scan" unit still on, turn the control head SQUELCH control until the radio set squelches (noise is heard from the speaker). Note the current reading. Subtract step 4. current reading from this current reading -- the difference should not exceed 350 milliamperes.

(b) Voltage Regulator Output

1. Measure the voltage across capacitor C30 with the dc voltmeter. It should be 10 V dc, ±6%.

2. Measure the voltage across capacitor C31 with the dc voltmeter. It should be 5 V dc, ±6%.

(c) High-Speed Clock Multivibrator Frequency

1. With scan "on" and no rf signal in, set the SQUELCH control so that noise just cuts out (squelches) so that scanning is initiated.

2. With the oscilloscope, observe the waveform on the collector of Q7. Its frequency should be 70 Hz, ±10% as shown on waveform (18), top trace.

3. Turn the SQUELCH control until noise is heard from the speaker. Scanning should stop.

(d) Slow-Speed Clock Multivibrator Frequency and Non-Priority Lock-On

1. Set channel priority as follows:

- With priority model, press P4.
- With non-priority model, press NP1 through NP4 and set the control head frequency selector switch to F4.

2. Turn the SQUELCH control until noise from the speaker just cuts out.

3. Set the rf signal generator to the radio set F1 frequency @100 microvolts.

The unit should lock onto F1 (P1 or NP1 lamp illuminates brightly) and sample F4 (P4 or NP4 "flickers" slightly). Audio is not heard during this test because the rf input signal is not modulated, although it could be.

4. Observe the waveform on the collector of Q24 with an oscilloscope. The frequency should be 4 Hz, ±20% as shown on waveform (11), top trace.

5. Adjust the signal generator output to the F2 frequency, then F3 frequency

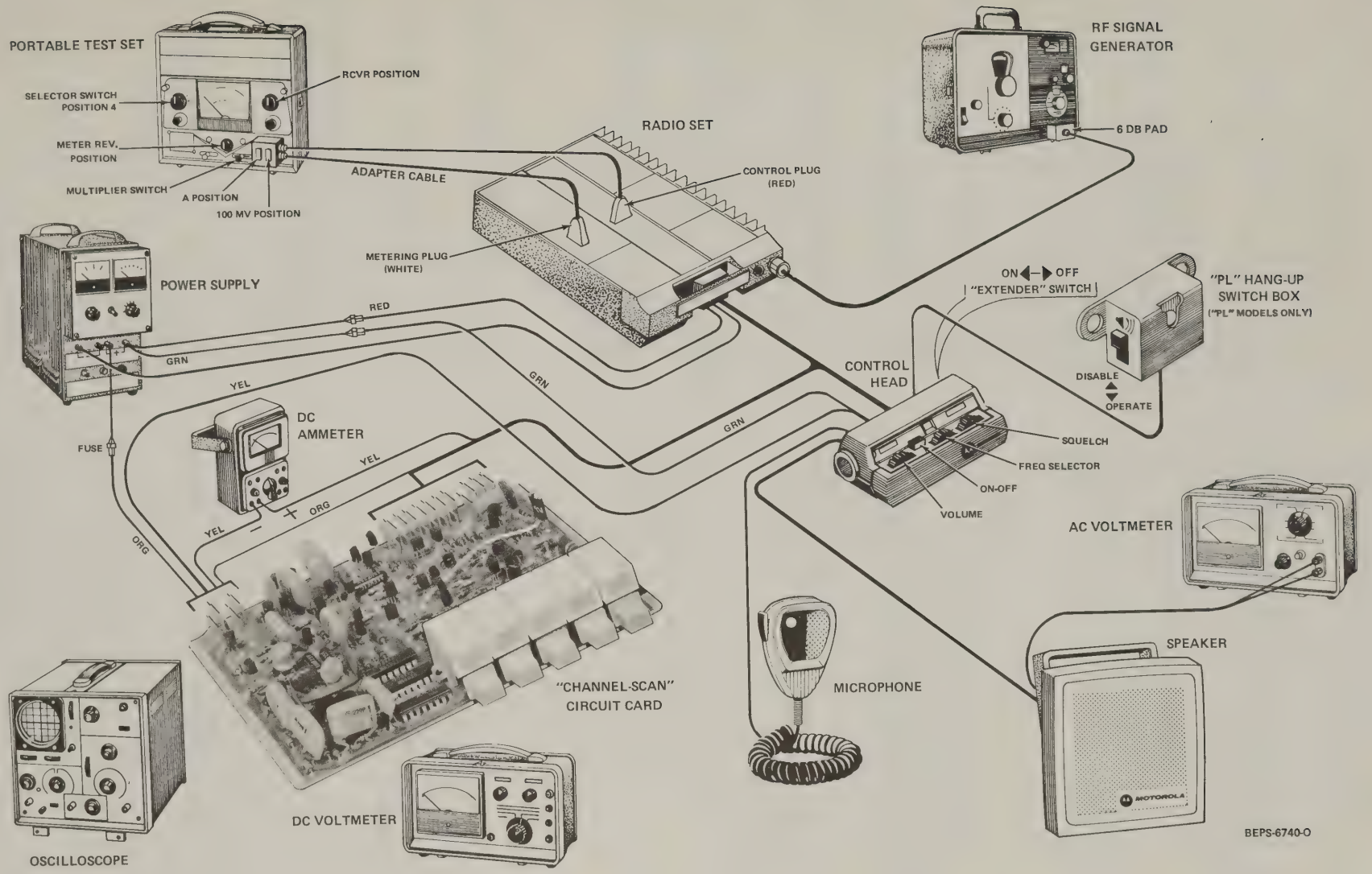

PORTABLE TEST SET
SELECTOR SWITCH POSITION 4
RCVR POSITION
METER REV. POSITION
MULTIPLIER SWITCH
A POSITION
100 MV POSITION
ADAPTER CABLE
RADIO SET
CONTROL PLUG (RED)
METERING PLUG (WHITE)
RF SIGNAL GENERATOR
6 DB PAD
POWER SUPPLY
RED
GRN
YEL
GRN
GRN
YEL
ORG
YEL
ORG
FUSE
DC AMMETER
CONTROL HEAD
ON ◀—▶ OFF
"EXTENDER" SWITCH
"PL" HANG-UP SWITCH BOX
("PL" MODELS ONLY)
DISABLE
OPERATE
SQUELCH
FREQ SELECTOR
ON-OFF
VOLUME
AC VOLTMETER
SPEAKER
MICROPHONE
"CHANNEL-SCAN" CIRCUIT CARD
DC VOLTMETER
OSCILLOSCOPE
MOTOROLA
BEPS-6740-O

Figure 32.

@100 microvolts. The unit should lock onto F2, then F3, respectively.

6. Select F1 for priority by pressing the P1 switch (priority model) or NP1 through NP4 switches with the control head frequency selector switch set to F1.

7. Set the rf signal generator to the radio set F4 frequency @1000 microvolts. The unit should lock onto F4 (P4 or NP4 lamp illuminates brightly) and sample F1 (P1 or NP4 "flickers" slightly).

(e) Sampling Time

1. With test equipment set up as in step (d) 5., observe the waveform at the collector of Q29 with an oscilloscope. The channel element sampling period (0 volts) should be greater than 6 milliseconds (see waveform (11)).

2. Disconnect the signal generator. The sampling period at the collector of Q29 (0 volts) should still be greater than 6 milliseconds (see waveform (1)).

(f) Priority Lock-On

1. Set channel priority as follows:

- With priority model; press P4.
- With non-priority model; press NP1 through NP4 and set the control head frequency selector switch to F4.

2. Connect the signal generator as shown in Figure 31 and adjust it to the radio set F4 frequency @100 microvolts. The unit should lock on F4 and the P4 or NP4 lamp should light at full brilliance with no "flicker". Repeat this step with F1, F2, and F3 selected as priority.

(g) Sensitivity

1. With the "Channel-Scan" monitor switches set as in step (f) 1., set the signal generator output level to zero and turn the SQUELCH control counterclockwise until noise is heard from the speaker.

2. With the ac voltmeter connected to audio output as shown in Figure 32, adjust the control head VOLUME control for 0 dB.

3. Adjust the SQUELCH control until noise is just cut out to initiate high speed scanning.

4. With the signal generator set to F1, slowly increase the output level until noise is heard from the speaker.

5. Observe the ac voltmeter reading. It should be less than -6 dB (non-priority sensitivity).

6. Readjust the signal generator to F4 at minimum output. Do not change previous SQUELCH and VOLUME settings.

7. Slowly increase the signal generator output level until noise is heard from the speaker.

8. Observe the ac voltmeter reading. It should be less than -6 dB (priority sensitivity).

(h) Noise Oscillator Frequency

1. With the rf signal generator disconnected, turn the SQUELCH control until noise from the speaker is just cut out.

2. Observe the waveform at the collector of Q33. The frequency should be 16 kHz, ±3.2 kHz (see waveform (13)).

3. Turn the SQUELCH control until noise is heard from the speaker. The noise oscillator should stop.

(i) Muting

1. With no rf signal input, turn the SQUELCH control until noise is heard from the speaker.

2. Set the VOLUME control for 0 dB on the ac voltmeter.

3. Turn the SQUELCH control until noise from the speaker is just cut out and note the ac voltmeter reading. It should be greater than -50 dB.

4. Turn the SQUELCH control until noise is heard from the speaker. (Reset the VOLUME control if necessary for 0 dB on the ac voltmeter).

5. Apply 10 volts dc through a 3.3 kilohm resistor to the base of Q30 and observe the ac voltmeter reading. It should be greater than -50 dB.

(j) Revert

1. Turn the "Channel-Scan" monitor unit off with the SCAN on-off switch.

2. Connect the "Channel-Scan" monitor jumpers as follows:

MODEL	JUMPER		
	JU1-JU8	WHITE	RED
Priority	All Connected	To "PS" Post	To "S" Post
Non-Priority	All Removed	To "S" Post	To "S" Post

3. Set the control head frequency selector switch to the F1 position.

4. Tune the signal generator to F1 @1000 microvolts and apply modulation. This signal should be received by the "Micor" radio.

c. Troubleshooting Integrated Circuits

Integrated circuits (IC's) are very reliable components and should not be replaced until all checks have proven definitely that the IC is the defective component. Removal of an IC is time consuming and often ruins the part. Therefore, a few extra checks before that task is attempted are worthwhile. Before replacing a bad IC, make sure that the external components in the circuit are normal.

The IC's in the "Channel-Scan" monitor may be checked by dc voltage measurements although signal tracing with an oscilloscope is preferred. Typical dc voltages are shown on the schematic diagram. Waveforms are shown on the waveforms diagram.

If an IC is to be replaced, heat each IC terminal and remove all solder with a "solder sucker" vacuum bulb or use a special IC removing tool.

d. Repair

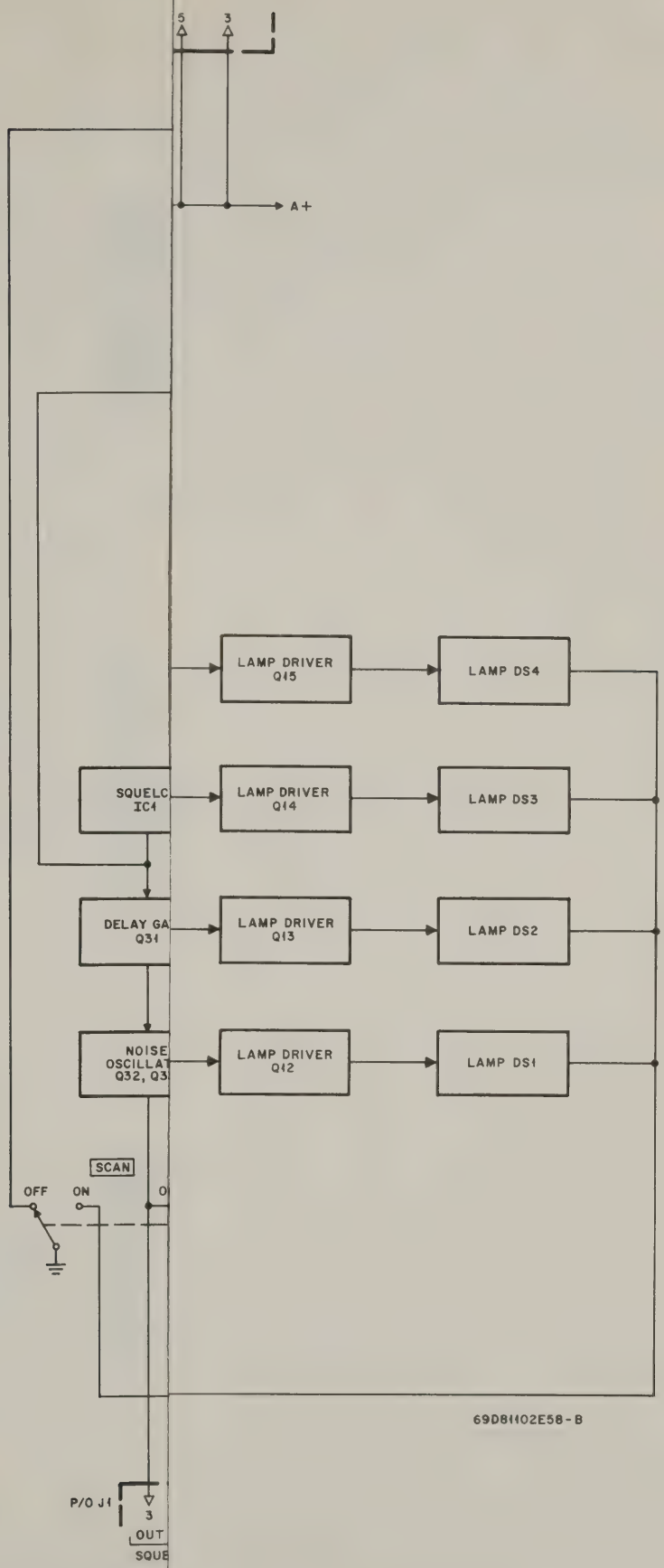
Any component on the circuit card can be replaced by following accepted repair procedures. Refer to the "Micor" radio instruction manual for information pertaining to ordering replacement parts. Upon completion of repairs, the circuit card is reinstalled as follows:

(1) Disconnect the two connectors from the circuit card.

(2) Slide the card completely into the housing.

(3) Install the rear housing cover and secure with two captive screws.

(4) Reconnect the two connectors to the proper locations.


5
3
A+
LAMP DRIVER Q15
LAMP DS4
SQUELC IC1
LAMP DRIVER Q14
LAMP DS3
DELAY GA Q31
LAMP DRIVER Q13
LAMP DS2
NOISE OSCILLAT Q32, Q3
LAMP DRIVER Q12
LAMP DS1
SCAN
OFF
ON
69D81102E58-B
P/O J1
3
OUT

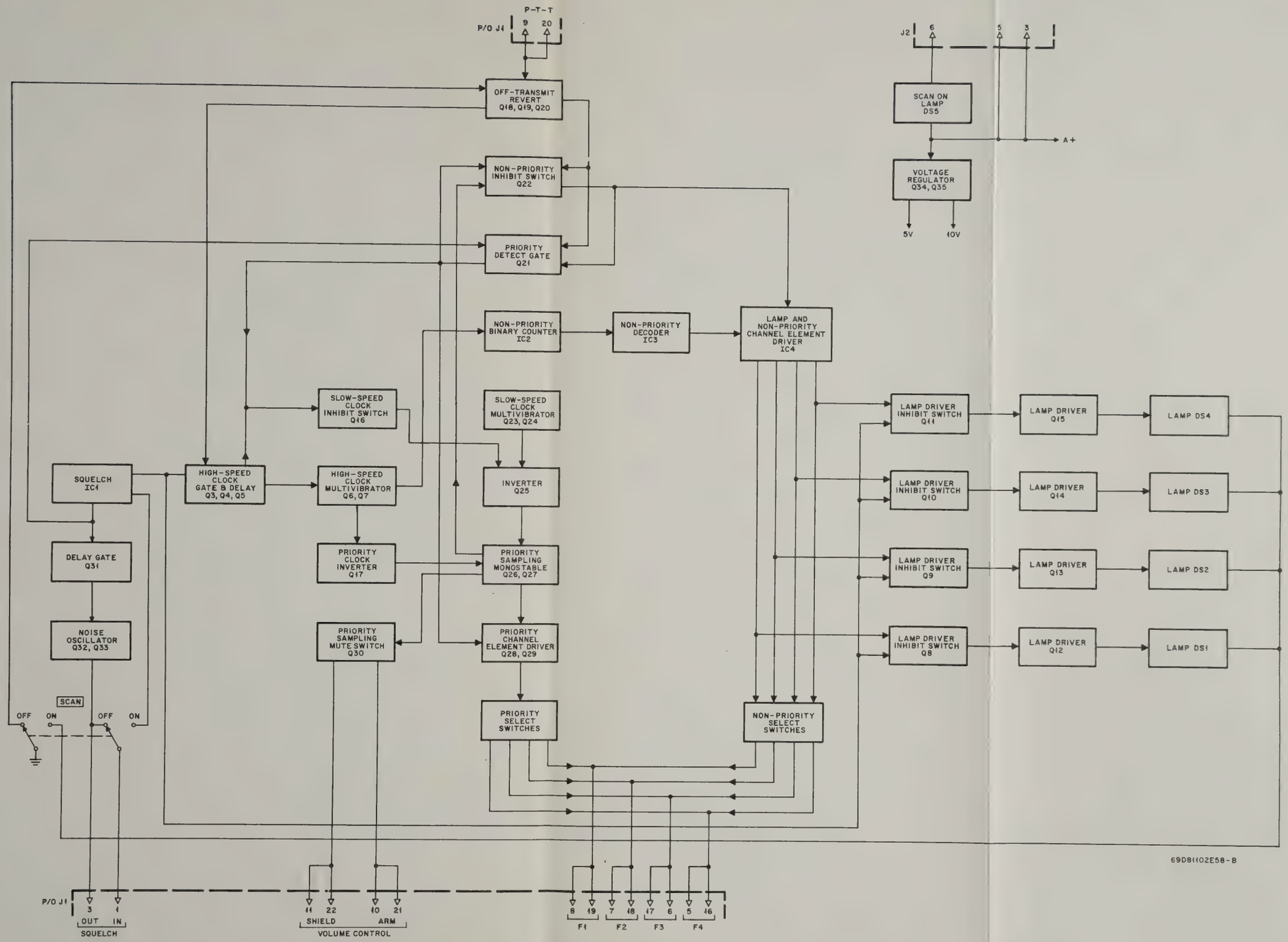
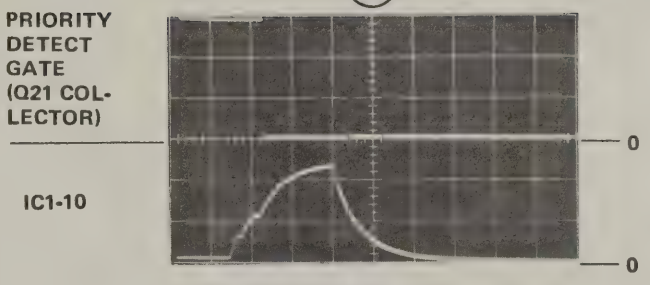


Figure 33.
"Channel-Scan" Monitor Block Diagram

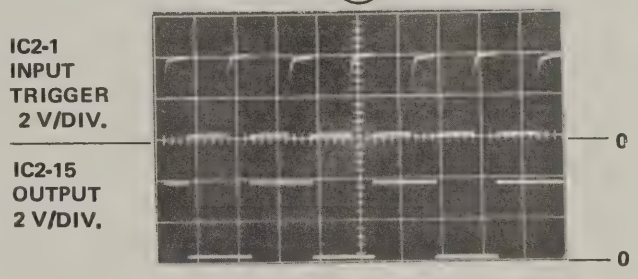
(17)



2 V/DIV.
2 MSEC/DIV.

RECEIVED NON-PRIORITY SIGNAL

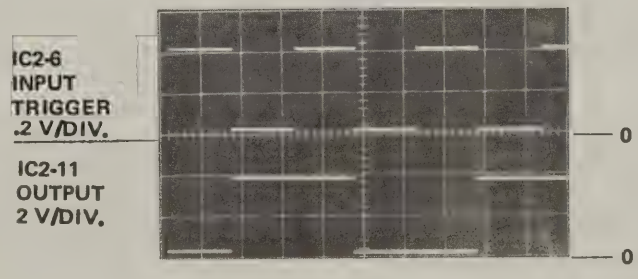
(18)



10 MSEC/DIV.

NO ON-CHANNEL SIGNAL

(19)

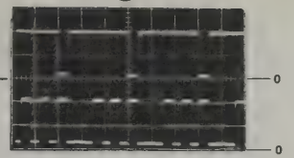


10 MSEC/DIV.

NO ON-CHANNEL SIGNAL

* SHOWS PRIORITY ELEMENT BEING SCANNED DURING TIME INTERVAL WHEN NON-PRIORITY COUNTER AND PRIORITY DRIVER IS SAMPLING CHANNEL SUCCESSIVELY. EXAMPLE WITH F3 AS PRIORITY: F1, F3, F2, F3, F3, F3, F4, F3, ETC.

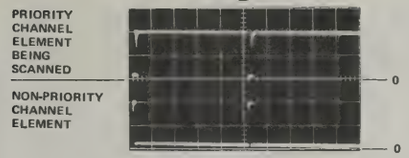
(1)



5 V/DIV.
20 MSEC/DIV

NO ON-CHANNEL SIGNAL

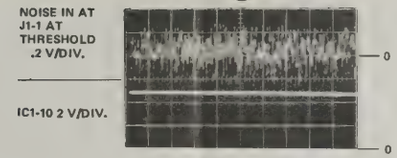
(2)



5 V/DIV.
50 MSEC/DIV.

RECEIVED NON-PRIORITY SIGNAL

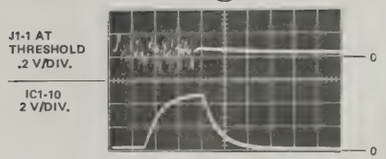
(3)



5 MSEC/DIV.

NO ON-CHANNEL SIGNAL

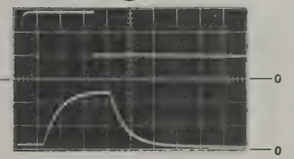
(4)



2 MSEC/DIV.

PRIORITY SAMPLED DURING RECEIVED NON-PRIORITY SIGNAL

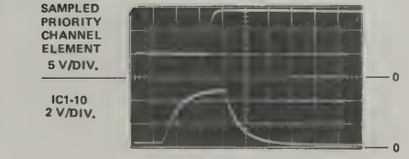
(5)



2 MSEC/DIV.

RECEIVED NON-PRIORITY SIGNAL

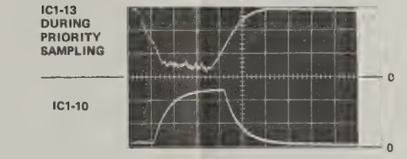
(6)



2 MSEC/DIV.

RECEIVED NON-PRIORITY SIGNAL

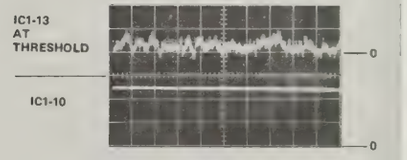
(7)



2 V/DIV.
2 MSEC/DIV.

RECEIVED NON-PRIORITY SIGNAL

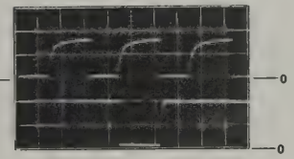
(8)



2 V/DIV.
5 MSEC/DIV.

NO ON-CHANNEL SIGNAL

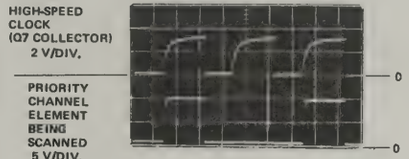
(9)



5 MSEC/DIV.

NO ON-CHANNEL SIGNAL

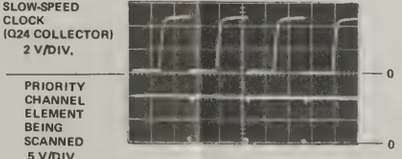
(10) *



5 MSEC/DIV.

NO ON-CHANNEL SIGNAL

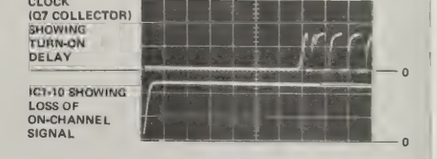
(11)



100 MSEC/DIV.

RECEIVED NON-PRIORITY SIGNAL

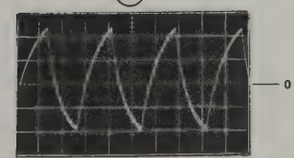
(12)



2 V/DIV.
20 MSEC/DIV.

ON-CHANNEL SIGNAL LOST

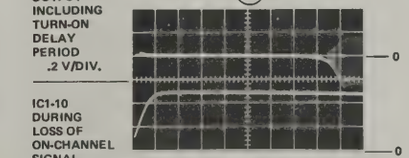
(13)



.1 V/DIV.
20 uSEC/DIV.

NO ON-CHANNEL SIGNAL

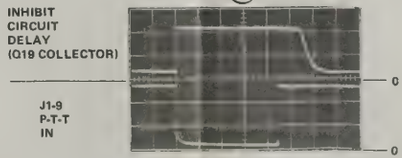
(14)



5 MSEC/DIV.

ON-CHANNEL SIGNAL LOST

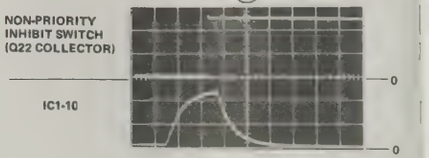
(15)



5 V/DIV.
100 MSEC/DIV.

P-T-T INPUT

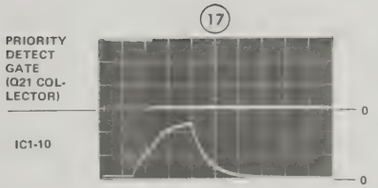
(16)



2 V/DIV.
2 MSEC/DIV.

RECEIVED NON-PRIORITY SIGNAL

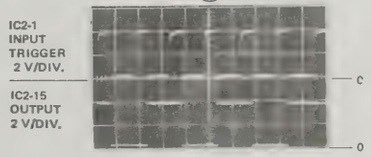
(17)



2 V/DIV.
2 MSEC/DIV.

RECEIVED NON-PRIORITY SIGNAL

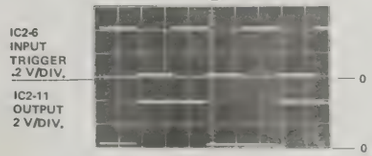
(18)



10 MSEC/DIV.

NO ON-CHANNEL SIGNAL

(19)



10 MSEC/DIV.

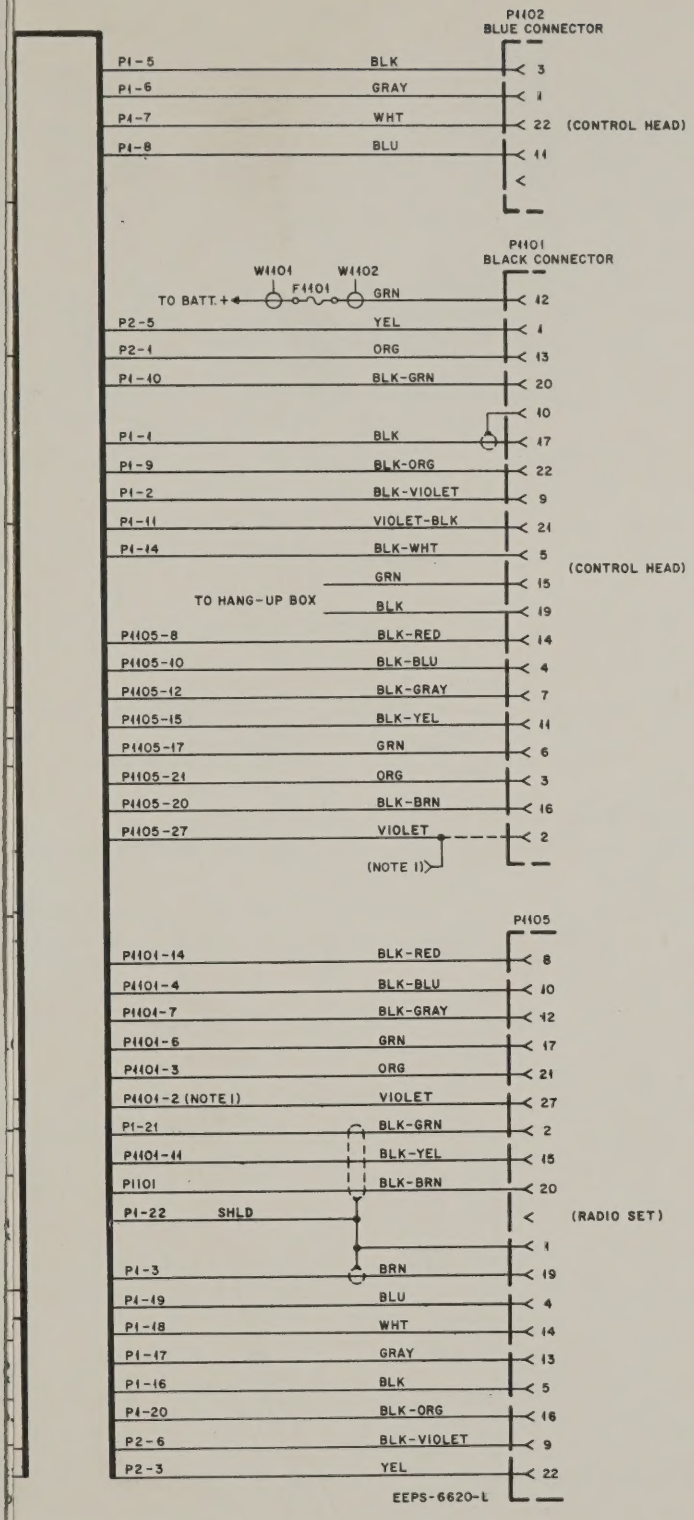
NO ON-CHANNEL SIGNAL

* SHOWS PRIORITY ELEMENT BEING SCANNED DURING TIME INTERVAL WHEN NON-PRIORITY COUNTER AND PRIORITY DRIVER IS SAMPLING CHANNEL SUCCESSIVELY. EXAMPLE WITH F3 AS PRIORITY: F1, F3, F2, F3, F3, F3, F4, F3, ETC.

EPS-6628-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
71	6S131527	47k
72	6S129669	4.7k
73	6S129981	3.3k
74	6S129886	27k
75	6S129526	33k
76	6S129668	10k
77	6S131275	220
78	6S129709	470
79	6S129805	1k
30	6S129881	3.3k
31	6S131275	220
32	6S129881	3.3k
33	6S129668	10k
34	6S131523	27
35	6S131276	150
36	6S129805	1k
37	6S6390	180 ±10%; 1 W
38	6S129299	68k
39	6S131527	47k
90	6S129886	27k
91	6S131527	47k
		SWITCH ASSEMBLY, push: (non-priority)
	40D84324C05	4 independent sections; each section "push-to-actuate, push-to-return"; consists of:
A		2 form "C"
B		2 form "C"
C		2 form "C"
D		2 form "C"
	40D84324C09	4-section; interlocking; with lockout; consists of:
A		2 form "C"
B		2 form "C"
C		2 form "C"
D		2 form "C"
	40D84324C01	single-section; "push-to-actuate, push-to-return"; 2 form "C"
		CABLE ASSEMBLY,
1101		(for reference only)
1102		(for reference only)
	NON-REFERENCED ITEMS	
	38C84321C01	PUSHBUTTON (shadow pearl)
	38C84321C02	PUSHBUTTON (orange)
	38B84617C01	SPACER, pushbutton lockout
	66C84699B01	CONTACT REMOVAL TOOL
	13D84319C11	ESCUTCHEON: (priority)
	13D84319C09	ESCUTCHEON: (non-priority)
	14C84360C01	INSULATOR, switch
	14C84006D01	SPACER, switch
	26B84018B01	HEAT SINK, transistor
	4K483513	WASHER, insulating

NOTE: Replacement diodes and transistors must be ordered by Motorola part number only for optimum performance.



LY TIED BACK AT CONTROL HEAD.
WITH MULTIPLE "PL" OR SINGLE-TONE
M 90 INTERCABLING CHART.

"Channel-Scan" Monitor
Schematic Diagram & Circuit Board Detail
Motorola No. 63P81102E24-H
(Sheet 2 of 2)
6/23/78-NPC

COMPONENT LOCATIONS GUIDE

REF. SYM.	KEY NO.	REF. SYM.	KEY NO.	REF. SYM.	KEY NO.	REF. SYM.	KEY NO.
C1	E3	CR20	B4	Q30	A3	R45	B2
C2	D5	CR21	B4	Q31	B1	R46	C2
C3	D5	D01	D3	Q32	D1	R47	B2
C4	D5	D02	D3	Q33	B1	R48	B2
C5	D5	D03	E2	Q34	C6	R49	B2
C6	D5	D04	E2	Q35	C5	R50	B2
C7	D5	D05	E1	R1	D5	R51	A3
C8	D6	IC1	D5	R2	D5	R52	A2
C9	D6	IC2	E4			R53	B3
C10	E5	IC3	E4	R4	E5	R54	B4
C11	E6	IC4	D4	R5	E5	R55	B2
C12	D6	J01	D4	R6	D6	R56	B3
C13	E5	J02	D3	R7	E6	R57	B3
C14	A4	J03	D2	R8	E6	R58	B4
C15	C5	J04	D2	R9	E6	R59	B4
C16	B5	J05	C4	R10	A3	R60	C5
C17	D5	J06	D3	R11	A3	R61	C6
C18	C5	J07	D5	R12	A4	R62	B6
C19	C1	J08	D1	R13	A4	R63	C5
C20	B6	J09	D1	R14	A4	R64	B6
C21	B6	J10	C3	R15	A3	R65	A5
C22	A5	Q1	E6	R16	B4	R66	A5
C23	A5	Q2	E6	R17	D5	R67	B5
C24	A5	Q3	A4	R18	B5	R68	B5
C25	C6	Q4	B4	R19	B5	R69	C5
C26	C5	Q5	B6	R20	C5	R70	B4
C27	C5	Q6	B5	R21	C6	R71	B4
C28	A1	Q7	C5	R22	B5	R72	B3
C29	C4	Q8	C4	R23	E5	R73	A3
C30	C5	Q9	C4	R24	C4	R74	A3
C31	C5	Q10	C3	R25	C4	R75	A2
C32	B4	Q11	C2	R26	C3	R76	B1
C33	B3	Q12	C2	R27	C2	R77	B1
C34	B5	Q13	C3	R28	C4	R78	B1
C35	B5	Q14	C2	R29	C3	R79	B1
C36	B5	Q15	D2	R30	C2	R80	B2
C82	B5	Q16	A6	R31	C1	R81	B2
C83	C4	Q17	B5	R32	C5	R82	B1
C84	C3	Q18	B4	R33	C6	R83	B1
C85	C1	Q19	C2	R34	C3	R84	C5
C86	C1	Q20	C2	R35	C1	R85	C6
C87	B4	Q21	C2	R36	C4	R86	D6
C88	B2	Q22	C3	R37	D3	R87	C1
C89	B2	Q23	C3	R38	C2	R88	A6
C810	A2	Q24	B6	R39	D1	S1 or	D2 &
C811	B3	Q25	A5	R40	D1	S2	D3
C812	B3	Q26	A5	R41	B2	S3	D1
C813	B4	Q27	B5	R42	B2		
C814	B5	Q28	C3	R43	B3		
C815	A5	Q29	C3	R44	C1		
C816	C6						
C817	C6						
C818	A6						
C819	C2						

EPS-6742-C

NOTES:

1. RED JUMPER J09 CONNECTS TO:
   PRIORITY MODEL -- POST "S"
   NON-PRIORITY MODEL -- POST "S", "1", "2", "3", OR "4".
2. WHITE JUMPER J010 CONNECTS TO:
   PRIORITY MODEL -- POST "PS"
   NON-PRIORITY MODEL -- POST "S", "1", "2", "3", OR "4".
3. NO (S1A-S1D) SWITCH ASSEMBLY IS USED WITH NON-PRIORITY MODEL ONLY. THE SWITCHES ARE NOT INTERLOCKED (ALL FOUR MAY BE CLOSED SIMULTANEOUSLY). P (S4A-S4D) SWITCH ASSEMBLY IS USED WITH PRIORITY MODEL ONLY. ONLY ONE SWITCH MAY BE CLOSED AT A TIME.
4. JUMPERS J015 THRU J018 ARE CONNECTED IN PRIORITY MODEL ONLY.
5. ALL VOLTAGE MEASUREMENTS ARE REFERENCED TO CHASSIS GROUND WITH 13.8 V DC APPLIED AND THE CONTROL HEAD SQUELCH CONTROL SET AT THRESHOLD. NON-PRIORITY SWITCHES S1-A THRU S1-D ARE CLOSED. INPUT SIGNAL LEVEL, WHEN APPLIED, IS 100 mV.
   * ——— V = UNIT ON OR OFF.
   ——— V = UNIT OFF.
   ——— V = UNIT OFF.
   ——— V = UNIT SCANNING - NO RF CARRIER PRESENT.
   ——— V = UNIT SCANNING - NO RF CARRIER PRESENT, UNIT RECEIVING A NON-PRIORITY SIGNAL ON F1. F2 SELECTED FOR PRIORITY.
   ——— V = UNIT RECEIVING A PRIORITY SIGNAL ON F2.
6. ALL RESISTOR VALUES ARE GIVEN IN OHMS UNLESS OTHERWISE NOTED. K = KILOHM.
7. ALL CAPACITOR VALUES ARE GIVEN IN PICOFARADS UNLESS OTHERWISE NOTED. uF = MICROFARADS.
8. VOLTAGE DEPENDENT ON SIGNAL INPUT. VOLTAGE LOW WITH STRONG SIGNAL, HIGH WITH WEAK SIGNAL.

EPS-6761-A

TRANSISTOR DETAILS

KEYWAY

SIDE VIEW J1 & J2

KEYWAY

VIEW FROM BACK EDGE OF BOARD J1

SHOWN FROM SOLDER SIDE

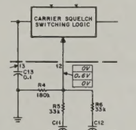
SOLDER SIDE ⓑ 80-19494-1813-A
COMPONENT SIDE ⓒ 80-19494-9530-O
OL-EPS-9448-9

"Channel-Scan" Monitor
Schematic Diagram & Circuit Board Detail
Motorola No. 63P81102E24-H
(Sheet 1 of 2)
6/23/78-NPC

REVISIONS

63P81102E24-G

BOARD AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
TLN1387A-1 (TLN6519A-1) TLN1388A-1 (TLN6520A-1)	R3	REMOVED (1 MEG)	IC1-4
	C16	REMOVED 21C821B7B07, 470 pF	Q30 COLLECTOR
TLN1387A-2 (TLN6519A-2) TLN1388A-2 (TLN6520A-2)	C32	ADDED 21CR61B137, 4.7 uF	Q2 COLLECTOR
	CR22	ADDED 48C8Z4636H01	Z1-3, 5
	C37	FROM 23-83216C02, 15 uF TO 21DB3214C05, 6.8 uF	Q31 BASE
	C33	ADDED 21D8Z428B59, .01 uF	Q21 BASE
	C8	FROM 21DE187B20, .001 uF TO 21D8442681, 470 pF	IC1-3
TLN1387A-3, 4 (TLN6519A-3, 4) TLN1388A-3, 4 (TLN6520A-3, 4)	C89	FROM 48C8365H01 TO 48DB2256C13	Q19 COLLECTOR
	C10	FROM 8D8250G07, 6.1 uF TO 8D8250G11, 0.22 uF	IC1-13
	R5, 6	REMOVED	IC1-12
	C11, 12	REMOVED 8D8250G11, 0.22 uF CIRCUIT WAS AS SHOWN BELOW:	



	C27	ADDED SQUELCH TIMING CIRCUIT FROM 23DB3214C05, 6.8 uF TO 23DB3214C15, 4.7 uF	Q31 BASE
	R76	FROM 6S131527, 47k TO 6S129681, 3.3k	
TLN1387A-5 (TLN6519A-5) TLN1388A-5 (TLN6520A-5)	C36	ADDED 21-861442, .005 uF	Q26 COLLECTOR
	C37		Q1 BASE
	C38		Q4 BASE
	R76	FROM 6S129381, 3.3k TO 6S129668, 10k	Q31 BASE
	NOTE	ADDED	NOTES
	D01	FROM 48C8404TE01 TO 65C84047E02	PARTS LIST
	IC2	FROM 51R84084D15 TO 51R84084D15	
	IC3	FROM 51R84084D00 TO 51R84084D03	
	IC4	FROM 51R84084D21 TO 51R84084D01	
TLN1387A-6 (TLN6519A-6) TLN1388A-6 (TLN6520A-6)		JUMPER ADDED	J1-2, 13

PARTS LIST

IMPORTANT

USE ONLY THE FOLLOWING MOTOROLA PART NUMBERS WHEN ORDERING REPLACEMENT PARTS

TLN1387A "Channel-Scan" Monitor (Priority)
TLN1388A "Channel-Scan" Monitor (Non-Priority)

PL-1242-C

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed: uF; ±10%; 50 V, unl. stated
C1	8D8205G05	0.15
C2	21E24B159	750 pF; 300 V
C3	21DB3204B06	100 pF; 500 V; N1500
C4	23DB3214C15	4.7 ±20%; 25 V
C5	21DB39211	47 pF ±5%; 300 V; N330
C6	21D84493B05	1000 pF; 200 V; NZ200
C7	21D8442AB06	100 pF ±5%; 500 V
C8	21D8426B11	470 pF
C9	21DB218TB20	.001; 100 V
C10	8D8250G11	0.22
C13	8D8205G11	0.22
C14	23DB7B3B27	10; 25 V
C15	8D8205G05	0.15
C16	8DB205G05	0.15
C17	21D8-428B59	.01 +80-20%; 200 V
C18	21D8-428B59	.01 +80-20%; 200 V
C19	21DB-7B3B16	2.2; 15 V
C20	23DB-7B3B16	2.2; 15 V
C21	23DB-7B3B16	2.2; 15 V
C22	21D8-428B59	.01 +80-20%; 200 V
C23	21D8-428B59	.01 +80-20%; 200 V
C24	8D8205G11	0.22
C25	8D8205G41	0.39
C27	23DB3214C15	4.7 uF
C28	8D8205G23	.02; 100 V
C29	21D8-428B59	.01 +80-20%; 200 V
C30	23DB-3214C02	15 ±20%; 25 V
C31	23DB3214C02	15 ±20%; 25 V
C32	23DB-3214C17	0.1 uF ±20%; 15 V
C33	21D8-428B59	.01 uF
C34	8D8205G08	.033
C35	23DB-7B2H08	3.9 ±20%; 15 V
C36, 37, 38	21-861442	.002 +100-20%; 75 V
		SEMICONDUCTOR DEVICE, diode: (SEE NOTE)
CR1 thru 6	48C8365H01	silicon
CR7	48-8246H13	silicon
CR8, 9	48D8256C15	silicon; Zener type; 5.1 V ±5%
CR10, 11	48C8365H01	silicon
CR12	48D8256C15	silicon; Zener type; 5.1 V ±5%
CR13 thru 15	48C8365H01	silicon
CR16	48D8256C03	silicon; Zener type; 4.7 V ±5%
CR17	48D8256C12	silicon; Zener type; 5.6 V ±5%
CR18	48C8246H13	silicon
CR19 thru 21	48C8365H01	silicon
CR22	48C8246H13	silicon
CR23	48C8365H01	silicon
DS1	65C8404TE02	LIGHT, indicator: includes light diffuser and 10-volt lamp
DS2 thru 5	65C8404TE01	includes light diffuser and 10-volt lamp
F1101		FUSE: (for reference only)
F1102		(for reference only)
		INTEGRATED CIRCUIT:
IC1	51R84087A09	type M6709
IC2	51R84084D15	type M84D15
IC3	51R84084D20	type M84D20
IC4	51R84084D21	type M84D21
J1		CONNECTOR, receptacle: consists of contact terminals mounted on edge of circuit board, as follows: 28C84269C01 TERMINAL, contact: narrow mounting tab (lower row) 28C8426 9C02 TERMINAL, contact: wide mounting tab (upper row)
J2		consists of contact terminals mounted on edge of circuit board, as follows: 28C84269C01 TERMINAL, contact: narrow mounting tab (lower row) 28C84269C02 TERMINAL, contact: wide mounting tab (upper row)

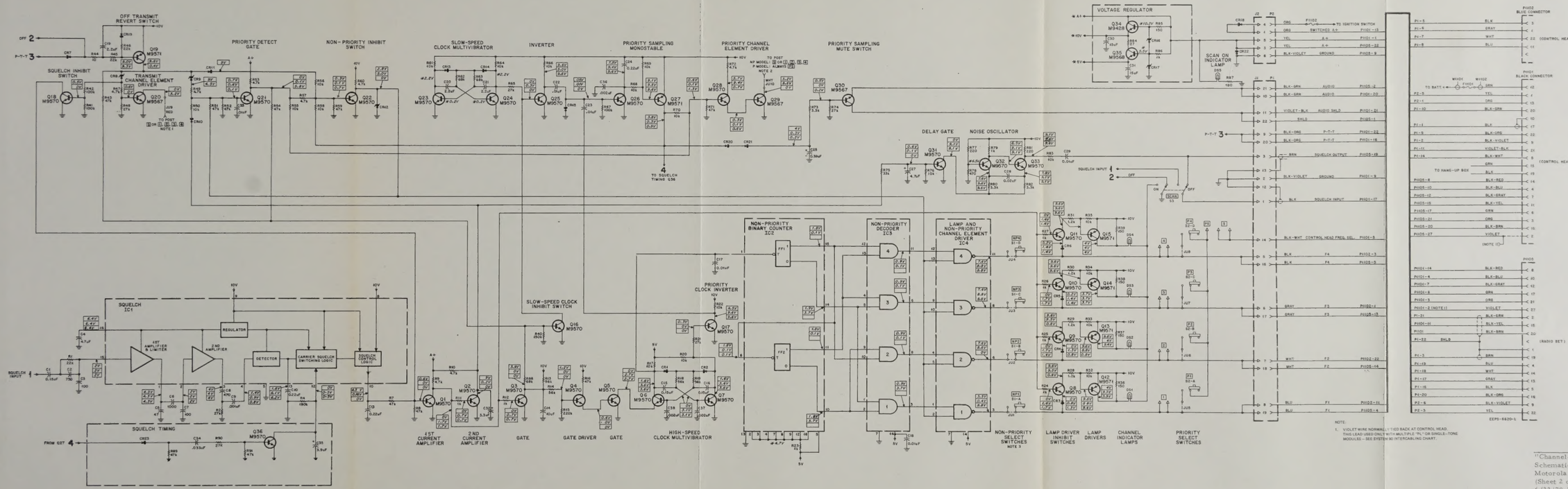
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
P1		CONNECTOR, plug: includes: 14C84556B06 BODY; numbered 1 thru 22 9C84151B01 TERMINAL, contact: female
P2		includes: 14C84590B01 BODY; numbered 1 thru 6; 9C84151B01 TERMINAL, contact: female
P1101		(for reference only)
P1102		(for reference only)
P1105		(for reference only)
		TRANSISTOR: (SEE NOTE)
Q1 thru 11	48R869570	N-P-N; type M9570
Q12 thru 15	48R869571	P-N-P; type M9571
Q16 thru 18	48R869570	N-P-N; type M9570
Q19	48R869571	P-N-P; type M9571
Q20	48R869567	N-P-N; type M9567
Q21 thru 26	48R869570	N-P-N; type M9570
Q27	48R869571	P-N-P; type M9571
Q28	48R869570	N-P-N; type M9570
Q29	48R869567	N-P-N; type M9567
Q30	48R869567	N-P-N; type M9567
Q31 thru 33	48R869570	N-P-N; type M9570
Q34	48R869428	N-P-N; type M9428
Q35	48R869568	N-P-N; type M9568
Q36	48R869570	N-P-N; type M9570
R1	6S129647	RESISTOR, fixed: ±5%; 1/4 W; unl. stated 22k
R2	6S129886	27k
R4	6S124B04	180k
R5	6S129526	33k
R6	6S129526	33k
R7	6S131527	47k
R8	6S131527	47k
R9	6S129669	4.7k
R10	6S129669	4.7k
R11	6S129805	1k
R12	6S129805	1k
R13	6S128584	56k
R14	6S128584	56k
R15	6S124B06	220k
R16	6S131527	47k
R17	6S129668	10k
R18	6S128584	56k
R19	6S128584	56k
R20	6S129668	10k
R21	6S129886	27k
R22	6S129668	10k
R23 thru 27	6S129805	1k
R28 thru 31	6S129708	1.2k
R32 thru 35	6S129668	10k
R36 thru 39	6S5645	150; 1/2 W
R40	6S126583	150k
R41	6S124A97	100k
R42	6S124A97	100k
R43	6S131527	47k
R44	6S124A01	10
R45	6S129667	22k
R46	6S129667	22k
R47	6S129669	4.7k
R48	6S129886	27k
R49	6S129669	4.7k
R50	6S129668	10k
R51	6S131527	47k
R52	6S131527	47k
R53	6S129669	4.7k
R54	6S131527	47k
R55	6S129668	10k
R56	6S129668	10k
R57	6S129669	4.7k
R58	6S129668	10k
R59	6S131527	47k
R60	6S129669	4.7k
R61	6S129668	10k
R62	6S129144	68k
R63	6S129144	68k
R64	6S129668	10k
R65	6S129886	27k
R66	6S129668	10k
R67	6S124A97	100k
R68 thru 70	6S129668	10k

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R71	6S131527	47k
R72	6S129669	4.7k
R73	6S129981	3.3k
R74	6S129886	27k
R75	6S129526	33k
R76	6S129668	10k
R77	6S131275	220
R78	6S129709	470
R79	6S129805	1k
R80	6S129881	3.3k
R81	6S131275	220
R82	6S129981	3.3k
R83	6S129668	10k
R84	6S131523	23
R85	6S131276	150
R86	6S129805	1k
R87	6S6390	180 ±10%; 1 W
R88	6S129299	68k
R89	6S131527	47k
R90	6S129886	27k
R91	6S131527	47k
S1	40D84324C05	SWITCH ASSEMBLY, push: (non-priority) 4 independent sections; each section "push-to-actuate, push-to-return"; consists of:
S1A		2 form "C"
S1B		2 form "C"
S1C		2 form "C"
S1D		2 form "C"
S2	40D84324C09	4-section; interlocking; with lockout; consists of:
S2A		2 form "C"
S2B		2 form "C"
S2C		2 form "C"
S2D		2 form "C"
S3	40D84324C01	single-section; "push-to-actuate, push-to-return"; 2 form "C"
W1101		CABLE ASSEMBLY, (for reference only)
W1102		(for reference only)

NON-REFERENCED ITEMS

	38C84321C01	PUSHBUTTON (shadow pearl)
	38C84321C02	PUSHBUTTON (orange)
	38B84617C01	SPACER, pushbutton lockout
	6QC84699B01	CONTACT REMOVAL TOOL
	15D84319C11	ESCUTCHEON; (priority)
	15D84319C09	ESCUTCHEON; (non-priority)
	14C84360C01	INSULATOR, switch
	14C84006D01	SPACER, switch
	25B84018B01	HEAT SINK, transistor
	4K483513	WASHER, insulating

NOTE: Replacement diodes and transistors must be ordered by Motorola part number only for optimum performance.



NOTE:

1. VIOLET WIRE NORMALLY TIED BACK AT CONTROL HEAD. THIS LEAD USED ONLY WITH MULTIPLE "PL" OR SINGLE-TONE MODULES - SEE SYSTEM INTERCABLING CHART.

"Channel-Scan" Monitor
Schematic Diagram & Circuit Board Detail
Motorola No. 63P81102E24-H
(Sheet 2 of 2)
6/23/78-NPC